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Physical Therapy as a Vocation

Ida May Hazenhyer, M. A.

Physical therapy, as we now know it, is a new profession; as the ancients knew it, it is as old as history. Hippocrates, the famous physician of the fifth century B. C., the ancient Egyptians, the early Greeks, all knew the value of sun treatments and baths of various sorts. Through the centuries people have turned to the physical sources of nature to maintain their health, and they have turned to the same sources in time of illness. Likewise they have used the old and tried measures of massage and exercise. In the ancient days these physical forms were regarded with high respect and administered with the honest conviction of real worth. But more recently, in the years before the World War, treatments in the class of physical therapy, though they were not usually known by that name, were looked upon with disfavor; they were used chiefly by those who did not have a reasonable knowledge of the work and who were interested in presenting to patients an attractive, different, and often spectacular form of treatment. Most of these people were classed as quacks.

But with the World War the pendulum began to swing back toward the high and respectable regard of the ancients, and forward, across the disreputable period, to the present time in which physical therapy takes its place in the legitimate practice of medicine. Dr. Frank B. Granger, who was already developing this new work in Boston when the war broke out, was placed in charge of all physical therapy in the army. Through his efforts and enthusiasm and those of others interested, the profession was greatly advanced and became a part of every army hospital. When the emergency hospitals were closed and the remaining soldiers sent to regular army hospitals and public health hospitals, the work was, and still is, carried on in these latter institutions. It was the pioneering in the army which demonstrated that there was something to this physical form of treatment.

A second great impetus was given to physical therapy when, in 1925, the Council on Physical Therapy of the American Medical Association was instituted. The purpose of this council was to lift the profession out of the still somewhat hazy atmosphere in which it struggled, place it in the realm of a recognized form of treatment, and give to it the dignity of an ethical part of medicine. Among the many services the council has rendered in these years is that of investigating and approving, or disapproving, the equipment put out by manufacturers so that doctors and institutions purchasing such equipment may have some means of knowing the value of it. Through the diligence of the council, much that was undesirable in the entire field was corrected or weeded out. There are still the quacks, as there are in other fields, and there are still those with only a slim hold on the work, but the profession is now firmly established. "Today we may say that it has assumed its correct position in ethical medical practice and has become a definite part of modern medicine."[1]

For physical therapy technicians, the group in which we are especially interested, the American Physiotherapy Association has done an important work. This association, a direct outcome of war service, was organized by a group of ex-army aides in 1921, under the name of American Women's Physical Therapeutic Association. Shortly after, the name

Physical Therapist, Jahn School for Crippled Children, Chicago, Ill.

was changed to the present one, and membership was opened to men. From that original small group of aides, the association has developed in numbers, in professional standards, and in its influence among those practicing as technicians. There are now almost a thousand members in the United States, and a few are in foreign lands. From a single little group in New York, the place of the first meeting, the organization has branched out over the country into twenty chapters and many members-at-large. During the years since its birth, the primary endeavor of the association has been: to form a nation-wide organ which will maintain a professional and scientific standard for those engaged in physical therapy; to promote the science of physical therapy; to aid in the establishment of educational standards and scientific research in physical therapy; to cooperate with and to work only under the prescription of members of the medical profession.[2]

One of the chief means of disseminating knowledge and advancing standards is through the official organ, THE PHYSIOTHERAPY REVIEW. The journal not only reaches every member, but it also enjoys an extensive subscription circulation. Upon its mailing list are found many institutions in this country and a goodly number in Europe, South America, Australia and other ports. Likewise many individuals who are not members of the association find the journal profitable reading. For the articles, dealing with all phases of physical therapy, are written by people well versed in their subjects: doctors from all over the country, members of the association and specialists in allied fields.

To realize how much physical therapy has advanced since the war, one need only to glance through the medical literature and note the references made to this treatment. Fifteen years ago little was said about physical therapy, and those who wished to "read up" on the subject had difficulty in finding anything to read. Now there are numerous books dealing exclusively with the subject: books on electrotherapy, on massage and exercise, and books covering all the forms. One of the notable publications is *Principles and Practice of Physical Therapy*, edited by Mock, Pemberton and Coulter, 1937. The JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION devotes a column to physical therapy and carries articles mentioning it. Articles are also to be found in other medical journals. "The fact that physical therapy is receiving more attention in the medical literature is obvious to any one who glances through the current journals or the Cumulative Index Medicus and compares these with a journal or a volume of the Index published five years ago. For example, in the April 4, 1936, issue of THE JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION the words 'physical therapy' appear in articles, announcements, committee reports, advertisements and so on, no less than seventy-nine times."[1]

Attention may be called to only a few of the books published since 1930 which recommend physical therapy treatments for various diseases: *Fractures*, by Paul B. Magnusen, M. D., two chapters and mention made throughout the book; *Infections of the Hand*, by Allen B. Kanavel, M. D., one chapter; *Arthritis and Rheumatoid Conditions*, by Ralph Pemberton, M. D., one chapter of thirteen pages; *Neurological Surgery*, by Loyal Davis, M. D., suggests massage, exercise, electrotherapy in treatment of spinal injuries; *Peripheral Nerve Injuries*, by Lewis J. Pollock, M. D. and Loyal Davis, M. D.; *Diseases of the Skin*, by George C. Andrews, M. D.; and a host of other general and special medical publications which mention physical therapy as one form of treatment.

EXTENT OF USAGE

Briefly physical therapy as restricted in a technician's work may be defined as: the treatment of disease by non-medical means, comprising the use of physical, chemical, and other properties of heat, light, water, electricity (except roentgen rays, radium,and electrosurgery), massage and exercise.[3] In some departments of physical therapy, all of these forms are used; in others, only a part of them. Hospitals and clinics with departments where a physician is in charge, and physicians' offices, usually make use of all the means, while schools for crippled children and public welfare institutions confine themselves to massage, exercise, sometimes ultraviolet, and hydrotherapy. This difference is due to the fact that the patients differ in the two groups. In hospitals, individuals treated are essentially patients with more or less active conditions; in the other institutions the individuals are people with physical handicaps which may or may not be active and which are, to a certain extent, chronic. In these latter places are found the cases of postpoliomyelitis, cere-

bral injuries, congenital conditions, chronic arthritis, old traumatic injuries, and various conditions which profit by physical therapy but which are not in the acute stages as are most of those found in hospitals.

According to a survey made by the American Medical Association in 1937, almost fourteen hundred hospitals in the United States were using physical therapy in their treatment of certain cases:

Alabama	8	Nebraska	12
Arizona	6	Nevada	1
Arkansas	8	New Hampshire	7
California	103	New Jersey	63
Colorado	19	New Mexico	2
Connecticut	24	New York	209
Deleware	4	North Carolina	18
Dist. of Col.	13	North Dakota	6
Florida	20	Ohio	66
Georgia	12	Oklahoma	18
Idaho	3	Oregon	13
Illinois	89	Pennsylvania	114
Indiana	24	Rhode Island	11
Iowa	20	South Carolina	6
Kansas	27	South Dakota	12
Kentucky	11	Tennessee	18
Louisiana	12	Texas	46
Maine	16	Utah	5
Maryland	17	Vermont	9
Massachusetts	76	Virginia	17
Michigan	51	Washington	31
Minnesota	28	West Virginia	11
Mississippi	8	Wisconsin	43
Missouri	39	Wyoming	4
Montana	10		

We do not have information as to the number of technicians in each hospital, or what training these people have had. However, we may assume that the majority, at least, have had a nursing background, for it is generally believed that the technician who is also a nurse is better fitted for a hospital department, while one with a physical education background is more desirable in a school for crippled children.

The *Manual of Hospital Standardization* prepared by the American College of Surgeons, in discussing the minimum standards for hospitals, urges the establishment of physical therapy departments: "Physical therapy has proved so advantageous in cases such as fractures, diseases of metabolism, and nervous disorders that almost every general hospital would find considerable use for such a department. This specialty frequently hastens convalescence, shortens the patients' average stay in the hospital, and improves end results. . . . It is important that well trained technicians be available to assist the director in the treatment of these cases. . . . The educational standards for technicians or aides should be that established by the American Physiotherapy Association."

During the early months of 1939, we attempted to secure some information concerning schools for crippled children, visiting nurse associations, and other institutions. Like all surveys, the following reports are far from complete. Out of a hundred and forty letters sent to educational institutions,[4] sixty-eight replies were received, and among these, twenty-one reported that no physical therapy was offered. Twenty-six letters were sent to public health institutions,[5] and twenty replies were received. But the reports do show a picture, steel-cut though it is not, of what is being done and to what extent physical therapy is used in these places. These reports, along with the above survey concerning hospitals, likewise offer a geographical picture which is interesting. It may be especially so to those who are planning to enter this comparatively new and growing vocation.

In seeking information, we were particularly anxious to learn two things: the number of people doing physical therapy in the various institutions, and the nature of the training these people have had. The responses were, on the whole, very satisfactory, but in some instances there was a question as to the training. We cannot be sure, in these instances, whether training was inadequate, or whether there was a misunderstanding concerning our request. The majority, however, indicated a training which meets with the requirements for membership in the American Physiotherapy Association. As could be expected, the background of those serving in schools for crippled children is, in most cases, that of physical education; there are only a few exceptions. On the other hand, and again with a few exceptions, those serving in visiting nurse associations have had a nurse's training before going into physical therapy.

The few western cities we found in our list of schools reported no physical therapy work carried on in the schools, with the exception of one part-time technician in one locality. From the east, nine cities reported a total of twenty-one technicians; from the middle west, fifty-two cities reported a hundred and four-

teen technicians. The following table indicates the number of technicians per city:

Cities with part-time technicians	16
Cities with 1 technician	20
Cities with 2 technicians	10
Cities with 3 technicians	4
Cities with 4 technicians	3
Cities with 5 technicians	2
Cities with 6 technicians	1
Cities with 24 technicians	1

Ohio and Wisconsin are organized into state units, Ohio under the Department of Education, Wisconsin under the Department of Public Instruction. In Wisconsin there are twenty-three technicians serving in eleven orthopedic schools, three extra technicians, and a director. (These figures are not included in the above table but are included in the total report of the middle west.)

The visiting nurse associations and similar organizations are about equally divided between the east and the middle west, with one reporting from the south. The following table indicates the number of technicians per institution:

No. of cities with 1 technician	4
No. of cities with 2 technicians	2
No. of cities with 3 technicians	6
No. of cities with 4 technicians	1
No. of cities with 5 technicians	1
No. of cities with 6 technicians	2
No. of cities with 8 technicians	1
No. of cities with 10 technicians	1
No. of cities with 11 technicians	1
No. of cities with 24 technicians	1

The training in this group is often initiated by the organization itself; that is, staff members act as teachers. Later the majority, as we understand the reports, augment this beginning by a course in physical therapy, usually one of the summer courses. But among these reports, as in those coming from schools, there is sometimes a question; we cannot be sure that the training is such as is required by the American Physiotherapy Association.

There are a great many technicians throughout the country who are not represented in any of the above tables. We know that many are employed in physicians' offices, but we have no way of knowing how many. There are also such places as the Foundation at Warm Springs, and there are such places as the Curative Workshop in Minneapolis and the Junior League Workshop in Milwaukee, all of which employ technicians. Likewise there are undoubtedly some sanitaria which offer physical therapy treatments.

The 1938 directory of the American Physiotherapy Association shows the following distribution of its members:

Hospitals	402
Schools	102
Public health	53
Physicians' offices	57
Clinics	44
Miscellaneous	240

The list is not quite complete, however, since some members did not respond to the questionnaire sent out.

The American Physiotherapy Association maintains a vocational bureau through which members may apply for positions and through which those employing technicians may receive help. During the year 1936-37, forty people were notified of positions, eight were placed through the bureau, and four by other means. In 1937-38, sixty-eight were notified of positions, nineteen were placed through the bureau, and eleven by other means. In the first six months of 1938-39, there were twenty-three applications, eight were placed by the bureau, and twelve by other means. There is a constant demand for well qualified and efficient workers in this field; in one school system, the demand is greater than the supply. "The need for such technicians" (properly trained and ethical) "is manifest and their training should be encouraged, provided it is understood that they are to work under direct medical supervision."[1]

BASIC QUALIFICATIONS

In any professional field education and training are very important, and these qualifications in relation to physical therapy will be taken up a little later. But before these there should come a consideration of the characters and aspirations of the individuals who are in the work and those who seek to find a place in it; for even education and training are not sufficient to make a successful and desirable technician who can do the work and can carry on the standards set by the American Physiotherapy Association for its members, and by the American Medical Association for all those in the work.

In any profession, the — shall we call it "temperamental" qualification — is all-important, but in the two fields dealing with the

minds and bodies of individuals, it is especially so; for within the realms of these two fields falls the molding of the physical and moral make-up of the race. The best teachers' college in the country cannot turn out a first-class teacher unless that individual has an inherent capacity and love for teaching. Knowledge of the subject and methods of presenting it are necessary, to be sure, but expounding knowledge without spirit is a mechanical procedure. The same is true of a profession which has to do with the body. A physical therapy technician may know anatomy and the allied subjects, may know how to perform the movements of massage and what exercises are best for given afflictions, and may know the technique of administering untraviolet and diathermy, but unless the technician has that other qualification which makes a perfect teacher, he or she will not make a first-class worker in physical therapy.

A patient is not a mechanical machine, wonderful as is his mechanism; he has a mind and a temperament. The medical profession recognizes this. A conscientious physician looks upon his patient as a being with two parts, body and mind, and while he deals with the body he does not forget that the body is a human one governed by that patient's individuality.

What then are the basic qualifications necessary in the making of a good technician? There must, of course, be an interest in the work beyond that of a means of making a living. It must be the interest of a professional worker rather than that of a piece worker in a factory or a salesman in a store or a stenographer in an office. Scientific research is constantly offering new ideas in physical therapy. The field is still comparatively young, and no one can afford to lean complaisantly back upon the certificate or diploma received from a course in physical therapy and feel that that course finished his or her education. A profession calls for more than mechanical efficiency.

Not only is an interest in the profession necessary; there is the equally important question of an interest in the type of individuals with whom the technician works, whether these people are crippled children or adults with their various difficulties, civilians or ex-soldiers, patients with real handicaps or those with neurasthenic tendencies. All of these appear before the technician in the various departments of physical therapy. The people working with these patients need an understanding of and a healthy sympathy for them. It is a human laboratory in which the technician works. If a patient can feel no bond between himself and his operator the good results of the treatment will be decreased by the patient's state of mind. Especially true is this in the field of massage where there is a direct contact between patient and operator.

But there is yet another point in this somewhat intangible realm of basic qualifications —the ethical standards adhered to by the American Physiotherapy Association, set forth in its by-laws: (1) The members of the American Physiotherapy Association shall work only under medical supervision or direction; (2) the members of the American Physiotherapy Association shall not advertise. Technicians do not have either the education or the legal right to diagnose and prescribe; their training and knowledge are limited to treating only under the supervision of physicians. This is an important point, and one which when violated places the worker in the realm of quacks and cults. There are the so-called physical therapists who do take upon themselves the privilege of working independently, but these are the people who are not only a hindrance to the science of physical therapy but are a danger to the patients who unwittingly submit themselves into incapable hands. There are uses and abuses of physical therapy, and only an ethical cooperation with physicians will save the profession and make it useful in the fields of its legitimate indications.

If the prospective worker in physical therapy is not ready and temperamentally fitted to meet the prerequisites of a good technician, it were better to side-step this profession and turn to a job in which character and personality are of less importance and one in which less damage can be done. For, let it be repeated, the physical therapy technician works with human bodies and personalities.

EDUCATION AND TRAINING

Before the World War, there was no such thing as a school of physical therapy, or even a short course. It was only during the emergency of the war that a few short courses were started to train "aides" who were to serve in reconstruction hospitals, and for a few more years these courses were all we had. Later several other courses were offered in different places, but there was no standard by

which they might be evaluated and no standard toward which they might aspire. Neither did those wishing to take courses have any definite means of knowing which courses were the best. The American Physiotherapy Association did attempt, in those days, to be something of a guide, but the help it could give was not based upon thorough investigation of the courses. Finally the American Medical Association, realizing the necessity of standardization, undertook, through the Council on Medical Education and Hospitals, to make a survey of the existing schools offering physical therapy and to draw up the "Essentials of an Acceptable School for Physical Therapy Technicians." Among other stipulations in these Essentials are statements of requirements for admission and a minimum curriculum:[6]

REQUIREMENTS FOR ADMISSION

Candidates for admission should be able to satisfy one of the following requirements:

a. Two years or sixty semester hours of college, including courses in physics and biology.
b. Graduation from an accredited school of nursing.
c. Graduation from an accredited school of physical education.

Courses in general physics, chemistry and biology are highly recommended for all who seek to enter training in physical therapy.

MINIMUM CURRICULUM

Subjects	Hours	
	Theory	Laboratory and Practice
Anatomy (including applied anatomy, demonstration on cadaver and lecture)	210	
Clinical practice		400
Electrotherapy	30	45
Ethics and administration	5	
Hydrotherapy	5	15
Massage	15	45
Pathology	30	
Physiology	30	45
Principles of physical therapy as applied to:		
Medicine	15	30
Neurology	10	15
Orthopedics	15	30
Surgery (including surgical observation)	15	30
Psychology	15	
Therapeutic exercise	30	75
Electives	45	
	470	730
Total	1,200 hours	

Suggested electives: asepsis, bandaging, first aid, history of physical therapy, hygiene, joint measurements, office routine, occupational therapy, records, social service.

All subjects should be taught by qualified teachers. Length of course: Not less than nine months.

Following the survey of the schools offering physical therapy, fourteen schools were approved and placed upon the accredited list. This list was published in the JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION, August 29, 1936, and a reprint of this list may be found in THE PHYSIOTHERAPY REVIEW, May-June 1938.

The requirements for membership in the American Physiotherapy Association have been developed through the years. As stated above, the charter members and those joining in the first months were ex-army aides with such training as was offered at that time and with such experience as was acquired in the army. During the first few years of the association's existence, applications for membership had to be considered by the executive committee on the basis of then-existing conditions. Experience was an important item, for chiefly by that could fitness for membership be judged. However, after a number of accredited courses in physical therapy were offered in different places, the association was able to make its requirements more restricted. Yet because there were still some technicians whose experience and general qualifications made them desirable for membership but who had not received a diploma from a school, examinations were offered in lieu of credits from a school. This year, however, the last examination of this sort is offered. Hereafter, all applications for membership must meet the requirements set forth in the by-laws:

1. Active members shall be admitted as follows: Active members shall have at least one year's practice in physical therapy within two years of graduation from:

a. A school of physical therapy acceptable to the American Physiotherapy Association, by which is meant a school which gives not less than three years' training in physical therapy.

b. A course in physical therapy acceptable to the American Physiotherapy Association, by which is meant a course in physical therapy of not less than nine months following graduation from a school of physical education, or a school of nursing which meets the requirements set by law in the individual states, or sixty college semester hours, twenty-six of which shall include physics, chemistry, and biological sciences.

The question of state regulation is confus-

ing, and we have no definite information concerning all the states. Many do have some sort of legislation regarding physical therapy and a few require a license of technicians practicing in the state. The committee on legislation of the American Physiotherapy Association, with the chapters' subcommittees, has been struggling for some years with the problem of legislation in different states, but both the information and the situations are far from satisfactory.

Salary

We leave to the last that which idealistically should be left to the last in considering a professional vocation — monetary remuneration. A year ago, the American Physiotherapy Association attempted, through a questionnaire sent to all its members, to make a survey of the salaries received by the members in different positions. The survey, as surveys go, is not complete, for out of 1,200 questionnaires sent, only four hundred forty-two were returned. However, even that limited number of replies shows a scale which is both enlightening and astonishing.

Total Salaries Reported			
Without Maintenance		With Maintenance	
$ 25—$ 50	5	36	$ 25—$ 50
50— 75	16	39	50— 75
75— 100	38	60	75— 100
100— 125	90	84	100— 125
125— 150	76	52	125— 150
150— 175	82	9	150— 175
175— 200	37	4	175— 200
200— 250	21	1	200— 250
250— 300	8	1	250— 300

After looking over this salary schedule, we may well reiterate and emphasize what we said above: that one who anticipates following physical therapy as a vocation does need a vision which can transcend the materialistic side of it.

References

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2. Constitution of the American Physiotherapy Association.
3. Ibid.
4. List from Statistics of Special Schools and Classes for Exceptional Children, Chap. VI of Vol. 11, 1937.
5. List from the National Organization for Public Health Nursing.
6. Journal of the American Medical Association, May 23, 1936, Vol. 106, pp. 1819 and 1820.

Pathological and Physiological Considerations of Arthritis

Theodore H. Vinke, M. D., F. A. C. S.

The pathological and physiological conditions of arthritis are of the utmost importance because too much emphasis often has been placed on the therapeutic aspects of the disease rather than on the disease itself. In the treatment of all diseases it is essential to know something about the fundamentals of the pathological functions. An orthopedist might be criticised for writing on a subject generally considered as belonging to the field of internal medicine. As a matter of fact, I agree that most patients with arthritis can best be treated by means of a close cooperation between an orthopedist and an internist. Nevertheless, both should understand the fundamental problems involved. And, likewise, the physical therapists also can do better work by becoming acquainted with the various aspects of the diseases in which they are interested. Such additional information will certainly be of considerable value in the intelligent application of physical therapy measures.

441 Vine St., Cincinnati, Ohio.

The fact that countless numbers of drugs have been advocated in the various forms of arthritis is evidence that the treatment has not been based on an intelligent approach to the problem. Even with such an approach it has not been possible to offer a real cure for the condition, but it does give us possibilities for a rational program in the treatment of these joint conditions. A few drugs and physical therapy measures have stood the tests of investigation and of time. The question

why some drugs as well as physical therapy measures are useful can be answered only by studying the pathological and physiological conditions in arthritis.

In discussing these conditions, our subject must be restricted to chronic nonspecific arthritis only; thus eliminating all the conditions caused by such organisms as the gonococcus, pneumococcus, tubercle bacillus. Even by limiting our subject to this extent many difficulties arise because there is still much disagreement as to the classification of arthritis regardless of whether the classification is made on etiological, pathological, or clinical manifestations. It has proven convenient to use two groups: the first group under the general classification of atrophic arthritis, and the second group under hypertrophic or osteoarthritis. There are certainly many cases that have characteristics of both groups.

In attempting to classify these conditions we soon realize that there is present a generalized pathological condition. We see that we are dealing not only with a joint condition but also that we are treating sick patients. The joints, the periarticular structures, the ligaments, muscles, bones, blood vessels, blood, and even the heart, lungs, and kidney may be in some way affected. Only by such a broad understanding of arthritis can we make definite progress in its treatment. As a result of this concept, arthritis is not quite the hopeless condition it used to be. Very definite advances have been made. However, we still have a long way to go.

Let us first concentrate on the atrophic or proliferative type of arthritis. It is the most disabling type of arthritis, and it usually develops during the first few decades of life. Pemberton has listed many possible causal factors in this disease: namely, heredity, constitution, body build, sex, age, trauma, nutrition, endocrine dyscrasias, anatomic imbalance, infection, parasitism, bacteria, allergy, exposure to cold or dampness, fatigue, disturbances of the nervous, circulatory, respiratory, and gastro-intestinal systems. It is important to bear these conditions in mind when one considers the pathological changes in this disease. These conditions again emphasize that atrophic arthritis must be more than just a disease of joints.

Many organisms have been found responsible for atrophic arthritis. Most frequently a variety of streptococcus has been found in the synovial fluid or in the periarticular tissues as well as in certain foci such as teeth, tonsils, prostates, gall bladder, etc. The question of the infecting organisms has been a subject of much debate. Other interesting possibilities have been suggested including the relationship of toxic products of organisms to joint pathology. Another possibility is the etiological factor of an allergic manifestation. It has been expressed by some that atrophic arthritis or some subdivisions in this group are caused by a sensitivity to certain organisms or their toxic products.

The concept of allergy necessarily brings us to the chemistry of the organisms and their toxins. The chemical nature of these factors is not known nor is the chemistry of the so-called bacterial antibodies known. That there are abnormal chemical changes present is also suggested by the following: high blood sedimentation rate, the presence of agglutinating agents, and the frequent incidence of skin sensitivity to suspensions of certain organisms. It is apparent that the exact nature of these influencing factors toward abnormal metabolism is not definitely known. Metabolic disturbance is evidenced in a variety of ways. Sugar metabolism seems to play a role in atrophic arthritis as evidenced by a tolerance lower than normal and by the apparent beneficial effect of a low carbohydrate diet. An altered protein diet does not have this effect on atrophic arthritis. One would expect an abnormal calcium phosphorous metabolism, but no such changes have been found in laboratory studies. Extensive studies have shown that the average blood volume is higher than normal. In hypertrophic arthritis it is lower. Change in the peripheral circulation is present in about seventy-five per cent of the cases of atrophic arthritis. The altered circulation is suggested by the low skin temperature. These changes in normal circulation are of particular interest to a physical therapist for it shows that measures which increase local or systemic blood flow tend to have a beneficial effect on atrophic arthritis by increasing the rate of systemic metabolism. The beneficial change is evidenced by an increase in the oxygen content of the blood and in clinical improvement. In contrast, the interference with the supply of blood to the involved tissues produces a condition which prevents the blood from receiving the necessary amount of glucose. Although massage stimulates and increases the circulation, there is no increase in lactic acid or other

metabolic products which are produced by active exercise.

I have discussed some physiological changes in various parts of the body to emphasize the fact that we are dealing with a generalized disease. There are certain definite changes that take place in the joints. Often our first manifestation of disease is the increase of amount of synovial fluid in involved joints. There is still much theoretical discussion about the production of synovial fluid and also its purpose. The primary purpose of this fluid is believed to be that of a lubricant and also a medium for nutrition to the articular cartilage, especially since there is no blood supply to this cartilage. It has been found that there is considerable similarity between the synovial fluid and the blood and synovia. Likewise, when certain foods are administered by mouth, such as glucose, there is a very rapid rise in the glucose content of the synovial fluid; and it may even reach a higher level than the glucose content in venous blood. It may be for this reason that substances absorbed from the gastro-intestinal tract may reach the synovial fluid rather promptly. This will give some foundation to the view that certain arthritic conditions are produced by certain pathological conditions in the gastro-intestinal tract.

It is conceivable that toxic material can be absorbed from the gastro-intestinal tract and carried through the blood stream to the synovial fluid. It is for this reason that in many cases of arthritis colonic irrigation is of some benefit. The beneficial effect is produced by removing toxic material from the gastro-intestinal tract. There may be other factors, however, in the gastro-intestinal system, such as distention and pathological conditions of the mucous membranes that may interfere with normal function. It appears, therefore, that the effects produced by colonic irrigation are not due to the removal of bacteria but to the removal of toxic substances. Physiological improvement also can be obtained by abdominal massage because of its mechanical effect and because better muscular tonicity is thus promoted.

Diet has been considered in relation to carbohydrate and protein metabolism, and here again it must be considered in relation to the caloric intake. It has been shown that a lowered caloric intake is beneficial. This beneficial effect is probably due to the increase of the metabolic rate and to the avoidance of colonic distention. Of course, it goes without saying that adequate nutrition is necessary. It also has been shown that a deficiency in certain vitamins, particularly A and C, reduces resistance to infection. There have been many reports showing that massive doses of vitamins have a very definite effect in arthritic conditions and that vitamin therapy definitely affects the colon. However, there are many contradictory reports.

In the majority of cases of atrophic arthritis the colon is characterized by an increase in length and a convoluted appearance. This condition is perhaps not an etiological factor. Furthermore, it is assumed that there is a loss of tonicity of the musculature rather than a congenital anomaly which would tend to produce this type of colon in that the sacculations become less prominent and that distention is more marked.

The various changes from normal physiology have been mentioned, but the characteristic pathological changes in the joints have not been discussed. Atrophic arthritis usually occurs in a slender bodied type of person. The smaller joints are the first to be affected, usually the midphalangeal joints of the fingers. These joints assume a spindle shape. Other joints may become similarly involved later or at the same time. Effusion usually occurs in these joints and locomotion is interfered with both by the effusion, muscle spasm, and later by destruction of cartilage. As the disease progresses, adhesions form, and the muscles about the joints become atrophied. Various contractures develop producing severe deformity. Fibrous nodules may sometimes occur along certain tendons, especially if there is considerable fibrositis.

There is a proliferation of the synovial membrane and of the perichondrium. This is particularly marked during the early stages of the disease. In conjunction with this condition, a pannus may form over the articular cartilages. This pannus is a granulation tissue which, when it comes in contact with the articular cartilage, produces softening and destruction is the usual consequence. If such destruction takes place, complete ankylosis may develop. With the proliferation of the synovia there is a proliferation of connective tissue and endosteum of the marrow spaces. In the formation of this granulation tissue there is a proliferation of blood vessels under the articular cartilage, and in this way the cartilage is destroyed from both sides. The

involvement of the endosteum is instrumental in the production of new bone. Consequently, new trabaculae are formed which tend to produce an ankylosis. The capsule may be greatly thickened, and with its contraction the joint space becomes narrower, and in this way causes the pathological articular cartilages to come in close contact with each other. This, of course, does not occur during the very acute stages. The bones about the affected joint show an increased permeability to the X-ray because of the bony atrophy both above and below the involved joints.

Our discussion so far has chiefly been on atrophic or proliferative arthritis. In hypertrophic arthritis, which usually occurs in older people, the general physiological and pathological discussion is not as involved. The onset is very gradual, and the change is sometimes considered a normal physiological change concomitant with old age and is frequently compared to the changes in the arteries as one develops arteriosclerosis. The larger joints are usually affected first, and the earliest change is a roughening or fibrillation of the cartilages. This usually occurs at the point where the greatest amount of pressure or friction exists. This area extends outward, and the cartilage becomes roughened and is no longer glistening. The process gradually increases, involving a larger and larger area, and the cartilage slowly wears down until bone is exposed. The bone gradually becomes eburnated and very smooth. This process is an entirely different one from that in atrophic arthritis, and ankylosis does not occur. Occasionally cysts develop in the bone near the articulations as a result of the disappearance of trabaculae and the liquefaction of the marrow. Consequently, this bone is softer than normal in spite of its hard glistening appearance so that when under pressure more or less extensive lipping of bone is produced around the joint edges. Sometimes complete bridging may occur, particularly in the spine. In the larger articulations the synovial membrane is somewhat thickened and villous in character, and there may be an effusion into the joint. Many small papilloma are present in this synovia which are large and coarse and their ends are broader than their bases.

The joints most commonly involved are the terminal interphalangeal joints. Occasionally these joints are involved alone and with very little changes in any of the other joints. These joints develop small round projections on their sides which slowly increase in size and are known as Heberden's nodes. The knee is involved almost as often as the interphalangeal joints, and it is of particular importance because it is a weight bearing joint. During the early stages there is considerable stiffness, but this stiffness is not due to cartilage or bony changes but rather to the thickening and loss of elasticity of the capsule and ligaments, thus producing limitation of motion. The hip is also commonly involved, and the same changes and symptoms are produced. Occasionally osteophytes are formed which are produced by overgrowths and partly ossified connective tissue. These osteophytes may be torn loose resulting in free bodies in the joint, or they may form a collar around the entire joint. In the hip joints the head becomes broadened, and the neck of the femur sometimes appears to be shortened. When the hip alone is involved it is often spoken of as coxae senilis, although this particular name is confusing and perhaps should not be used.

It has long been advocated that in this particular type of arthritis meat should be avoided in the diet. However, in many studies of Pemberton and others there is no metabolic disturbance in the formation of non-protein nitrogen, uric acid, creatin, or creatinine. Furthermore, there is no suggestion of a systemic acidosis as measured by the carbon dioxide combining power or the hydrogen ion concentration of the blood. The metabolism of the fat is normal, and the level of the blood calcium is not disturbed. There is no evidence of faulty kidney function. There has been much discussion in the relation of sulfur metabolism in both atrophic and hypertrophic arthritis. Studies of the finger nails sometimes show a low cystine content. When this is present sulfur therapy has been advocated.

Various experiments have been performed in an effort to produce osteo-arthritic changes. One method was by damaging the central part of the articular cartilages in animals after which typical osteo-arthritic and osteophytic formations developed. After the damage to the central portion of the articular cartilage, a regular sequence of events occurred. The experimental studies of absorption from joint cavities show that great care should be taken to maintain the circulation and nutrition of the joint in infectious and toxemic condition. It has also been shown that the repair of articular cartilage is extremely slow, and there is no actual formation of new cartilage cells.

Healing takes place by means of connective tissue and is more rapid at the lateral aspects of the joint while the healing is gradual in the central portion of the articular cartilage. This probably explains why there is an over production of bone and osteophyte formations on the lateral aspects of the joint. Furthermore, the lateral aspect of articular cartilage approximates the characteristics of the hyaline cartilage found in costal cartilage, gradually merging into fibrous tissues. The lateral part of the articulations receives far better nourishment than the central part. This, too, may be a factor in the production of bony overgrowth along the edges of the articulations in osteo-arthritis. The central portion of the articular cartilage is sometimes divided into three strata. The various layers have cells of different shapes and in different arrangements. In the earliest stages of osteo-arthritis, the poorly nourished portions of the articular cartilage are affected. It has already been stated that the central portion of the articular cartilage is subjected to a great amount of pressure and friction, but it is also important that the exposed cells in this central area do not receive as much nourishment as the cells in the more lateral portions of the joint. The changes develop slowly, and the so-called fibrillation of the cartilage is really a slitting of the matrix without the development of connective tissue. In the earliest stages of osteo-arthritis, the lateral portion of the cartilage shows no visible change to the naked eye, although in the central portion small grooves and indentations may be present.

The formation of new cartilage at the margins develops soon after the fibrillation is evident. New bone formation about the joint margins may be excessive even to the degree that it interferes with motion, but it does not produce ankylosis in the larger joints except in the spine. It will be noticed that the synovia is thickened where there is a proliferation and enlargement of villous processes. The synovial involvement may be quite localized during the early stages, but in later stages of the disease there is an increase in the size and number of the synovial villi. When these are examined during an operation they appear to be very vascular as compared to normal synovial membrane. Furthermore, there may be a formation of chondromata in the synovial villi which also vary greatly in size and shape and occasionally are pedunculated. In the later stages of the disease the hypertrophied synovial villi undergo secondary changes, and the membrane becomes comparatively smooth and atrophic. It is possible that arteriosclerotic changes in the vessels of the joint may be coincident or may play some part in this atrophic process.

Definite changes also take place in the capsule and other intra-articular structures: for instance, the semilunar cartilages of the knee joint may disappear entirely. The same changes may occur to the ligamentum teres in the hip joint. The disappearance of these ligaments may produce deformity and joint instability. Such changes take place in the long head tendon of the biceps when the shoulder is involved. This tendon may be involved by new bone formation because of its close relationship to the joint. Similar changes may sometimes take place in false joints and after traumas to certain joints, although in these situations the involvement is restricted to one joint. Whether or not endocrine disfunction has any relation to this disease has long been considered a possibility.

It would be impossible to give a detailed explanation of all the pathological conditions of arthritis in a short paper. The extent of the problem of the very disabling condition associated with the disease has been presented in brief form. It has been shown that a great deal more than the administration of simple drugs or some other form of percursory treatment is necessary to be of much benefit. In conclusion, it is once more apparent that the greatest advance is to be made in preventive rather than in curative measures.

"Wine, women, Baths, by Art or Nature warme,
Us'd or abus'd, do men much good or harme."—*From "The Baths of Bath" by P. Rowland James.*

Epiphyseal Injuries

Alexander P. Aitken, M. D., F. A. C. S.,* and Lucy Marshall**

Fractures of the epiphysis are among the most common injuries of childhood. Until recently, accurate studies of the end-results have not been made. As a result there have been many diversified opinions as to treatment and much confusion as to the prognosis of such injuries. Consequently, the significance of the various types of fracture has not been recognized.

The following factors are of importance in consideration of these fractures: (1) The susceptibility to injury. Epiphysis about the ankle, wrist, and elbow are most commonly injured. (2) Construction of adjacent joints. Epiphysis adjacent to joints with limited motion are more apt to be seriously injured. (3) Size and shape of the epiphysis. The larger and more irregularly shaped require more severe trauma and are, as a result, apt to be seriously damaged. (4) Age of patient. (5) Height of patient. If child has reached the near height of parents regardless of his age, he probably will not grow much more and premature ossification will not be a problem. (6) Weight bearing. Shortening from retarded growth means scoliosis. Malformation of weight bearing joint surfaces means deformity. (7) Activity and growth. The more active growing epiphysis when injured will show the greater loss of growth.

These various factors will be discussed at greater length later on. It can readily be seen that these factors vary with each epiphysis so that each fracture must be considered as an individual case.

Types of Epiphyseal Fracture

Consider the epiphysis as consisting of layers: (1) *First layer*—bony epiphysis. This forms the terminal portion of the bone and in most instances forms the articular surface. (2) Lying between the bony epiphysis and the cartilage plate is the *second layer*. In this region the cartilage cells of the epiphysis are being replaced by the bone cells of the bony epiphysis and this represents the area at which the bony epiphysis is growing. (3) *Third layer*. This is the cartilage plate. It is from the cells of this plate that future growth in length of bone will occur. Damage to this layer is the all important factor in epiphyseal injuries. (4) *Fourth layer*. Between the cartilage plate and the shaft proper is another zone made up of degenerating cartilage cells and new formed bone and this represents the area at which the shaft is growing. (5) This *fifth layer* is the end of the adult shaft.

Because growth from the shaft side of the epiphysis is more active than growth from the bony epiphysis, this layer is much larger than the second layer. Both are highly vascular and, because the new formed bone is soft, these areas are susceptible to injury. Fractures through these areas, however, are not as serious as the cartilage cells are degenerating and are about to be replaced by bone. Damage to the cartilage plate itself is a serious matter. Further growth of bone rests upon the integrity of the cells within this plate.

With these layers in mind, the three types of epiphyseal fractures can be readily understood.

Type I. Most common. Due to a shearing or twisting force such as a fall on the outstretched hand. The fracture line runs parallel and proximal to the cartilage plate through the layer of newly formed bone and transitional cartilage (4th layer) and emerges

Schematic drawing of X-ray appearance in epiphyseal fractures: A—Type I fracture, B—Type II fracture, and C—Type III fracture.

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through the shaft. There is no fracture of the cartilage plate; therefore, there will be no resulting deformity. Displacement may be great.

Type II. Due to a combined crushing and shearing. This appears on the X-ray as a fracture across the bony epiphysis which does not involve the shaft and shows little, if any, displacement. If the fracture line emerges distal to the cartilage plate through the zone of spongy bone (2nd layer), no deformity results. If the fracture line crosses the cartilage plate and emerges through the second layer of spongy bone (4th layer), the cartilage plate is injured and deformity results. Whether the cartilage plate has been crossed or not cannot be determined either clinically or by X-ray in this type of fracture. A guarded prognosis must therefore be given.

Type III. This injury is due to a crushing force. The bony epiphysis is driven against the shaft causing a fracture of both. The intervening cartilage plate is thus crushed between two bony structures. The fracture line crosses all the layers of the epiphysis and emerges through the shaft. Displacement is usually slight. Because of the damage to the plate, ossification usually appears at the point of crushing within a few months of the injury. The remainder of the epiphysis continues to grow and deformity results.

The age of the patient at the time of injury is of importance especially as regards premature ossification and retardation of growth. Fractures occurring near the time of normal ossification show little or no shortening. Fractures in the very young, however, may eventually show considerable shortening as there is a longer period of time over which it may develop. Clinically, this may be of little importance in non-weight bearing points where a shortening often can be detected only by careful measurements or X-ray. The situation in weight bearing bones is, however, a serious condition. Retardation of growth through injury to the entire cartilage plate causes premature ossification and a short leg. Structural scoliosis will be the inevitable result. Injury to a portion of the cartilage plate results in retardation of growth of that part of the bone only, the unaffected portion continues in normal growth and bony deformity results. Constant weight bearing will put undue strain on ligaments and muscles, the body weight will not be transmitted correctly and noticeable and faulty weight bearing will result. For example, at the knee joint fractures through the cartilage plate of the external condyle result in a knock-knee deformity and strain is present not only at the knee joint but is transmitted through the tibia and ankle joint to the foot. At the ankle, the same type of injury which produces a Potts' fracture in an adult results in the child in a crushed cartilage plate, early ossification and a deformity of the joint mortise which does not allow proper foot mechanics. These cases, unless otherwise protected with adequate apparatus and shoeing, will, as the result of abnormal pressure on immature bones, develop considerable deformity from altered pressure and a deformed foot will also result.

Reduction

It has been the teaching in the past that anatomical reposition of all epiphyseal fractures was essential in order to prevent deformity, the theory being that growth in the line of displacement would occur unless displacement was corrected. This teaching has been based on theory rather than practice. Nature protects the growing epiphysis following fracture far more zealously than she does adult bone. Any displacement of an epiphysis (Type I) following fracture is corrected within a few months. The periosteum which is firmly adherent to the epiphysis is stripped off the shaft on the side of the displacement while the periosteum on the opposite side tears away from the epiphysis. A triangle is thus formed by the epiphysis, the shaft and the periosteum which remains attached to the epiphysis but which has stripped off the shaft. This triangle then becomes filled with bone, laid down by the periosteum. In this way the shaft is built out to meet the epiphysis. The opposite side of the shaft absorbs so that a few months after the injury the entire shaft appears to have swung over to meet the epiphysis. By x-ray the shaft will appear deformed. As the child uses the limb, the normal bowing of the shaft returns and the shaft and epiphysis again assume a normal relationship. The epiphysis is united to the shaft within a few months and the normal curve is established in the shaft within two years. This correction will occur at any age even in those who are near the age of normal ossification. Displacement of Types II and III are also corrected in the same manner but deformity from unequal growth occurs in those cases in which the cartilage plate has been fractured or crushed. The only exception will be found in fractures where com-

plete rotation has occurred. Rotation of fragments by muscle pull is not corrected by Nature. This may occur in fractures of the capitellar epiphysis (which carries the origin of the forearm extensions) and in the rotated fractures of the proximal epiphyses of the radius and femur.

With the exception of the rotated capitellar epiphysis, open reduction should not be done. The cartilage plate may be damaged during the operation and a simple Type I fracture is thus converted into a Type III fracture and growth disturbance follows. This damage is especially apt to follow if an osteotomy is performed at the epiphyseal line. Transfixing the epiphysis to the shaft by means of pins, nails or screws should never be done. This form of fixation destroys the cartilage plate and causes prompt ossification at the point of transfixion. Closed reduction or manipulation should be carefully done. The degree of original displacement is no indication of the amount of damage done to the cartilage plate. If repeated manipulations fail to correct the displacement, the best possible position should be accepted. Within a few months Nature will correct the remaining displacement.

FACTORS INFLUENCING SUSCEPTIBILITY TO FRACTURE

Children are very prone to fall on the outstretched hand. This accident may result in either a fracture of the distal radial epiphysis or a fracture of one of the epiphyses of the distal humerus. Falls upon the feet are also extremely common, resulting in fractures of the distal tibial epiphysis. We cannot be sure that the commonly seen "slipped epiphysis" is due entirely to fracture. There are usually repeated attacks of pain and lameness which may go on for as long as a year and a half before the epiphysis finally fractures. There is, therefore, some underlying pathology peculiar to this epiphysis alone which causes lameness and disability long before fracture actually occurs. When such a fracture finally does occur, the trauma usually is trivial and hardly sufficient to fracture a normal epiphysis. In the past, when wagons were more commonly in use, boys hanging on the rear frequently caught their legs in the spokes of the rear wheel. Forced hyperextension produced anterior displacement of the distal femoral epiphysis. Lately, the automobile causes an injury which in the adult produces Fender fracture, in the child a fracture of the upper tibial epiphysis.

In general it may be said that in children, or until complete ossification of the epiphysis has taken place, fractures about or in joints produce either displacement of the epiphysis or fracture of the epiphysis or a combination of both. These are immobolized until all danger of slipping has passed. Then the joint should be used. Those cases in which poor position is noted should be doubly encouraged in active use of the joint. This hastens restoration of position. All free movements may be given. Baking and massage have no place in the treatment of these cases unless soft parts have been damaged. Even then a minimum amount of treatment is given. Free use of the part in activities which do not require jarring are to be encouraged. No exercises as such should be given. The only part that the physical therapist should play with these children is in devising or arranging for wise and safe activities and in encouraging the occasional timid child in the pursuit of these.

Premature ossification, retardation of growth and shortening frequently follow Type I injuries but are rarely of clinical significance and are negligible. Premature ossification with shortening always occurs in Type III cases and in the Type II fractures which have involved the cartilage plate. In the older patient, the entire epiphysis may fuse before deformity can occur. In the younger patient prompt ossification occurs within a year at the site of the injury. In such fractures the younger the patient, the worse the prognosis.

OPERATIVE CORRECTION OF DEFORMITY IN WEIGHT BEARING BONES

The time for performing operative correction (osteotomy) is a problem. If the patient is thirteen years or older it is probably best to wait until ossification is complete before correction. In younger patients structural changes will occur in weight bearing joints and in the spine as the result of faulty weight bearing. This may cause considerable disability if a corrective osteotomy is postponed until ossification has taken place. When deformity has become marked, an osteotomy should be done at once. A secondary correction may then be done after ossification is complete if the deformity recurs.

A Review of the Use of Medical Diathermy in the Treatment of Pneumonia—1916 to 1938

Ben L. Boynton, M. D.

The use of medical diathermy in the treatment of lobar and other types of pneumonia is a procedure which has been in use for almost a quarter of a century. A review of the literature discloses numerous references to its beneficial effects, a few references to its dangers, a few out-spoken articles questioning its value, and one outstanding piece of experimental investigation which is a classic in this field.

1916

The earliest reference to this subject that the author found is one by Price[1] who states that:

"During the stage of engorgement, and as well that of hepatization, however extensive, thermopenetration induced by the proper quality of current gives prompt relief, both subjective and objective. Further, it is an active form of treatment which extensively decreases the mortality percentage."

No definite mortality statistics are given. Geyser[2] and Wolf[3] in articles on diathermy do not mention its use in pneumonia.

1917

DeKraft[4] discusses the contraindications to high frequency currents but does not mention pneumonia among them.

1922

Stewart[5] in his original report on the use of diathermy in ten cases of pneumonia concludes as follows:

"The results in these cases are suggestive that diathermy may have an influence in hastening recovery in pneumonia. The evidence is not at all conclusive. In several of the cases the diathermy was not instituted until in favorable cases the temperature might be expected to start downward, but it is the opinion of the medical staff who selected these as test cases that diathermy helped in their recovery. When we have had many more cases to report on, we hope to be able to make a more definite statement, but this much we do know, that in every single case and in almost every single treatment the temporary effect upon the patients was remarkable. Cyanosis disappeared. The expiratory grunt when present was markedly lessened or stopped entirely. Respirations were less labored and the patient received from two to four hours of very marked relief, in many cases obtaining sound sleep.

"The fall of temperature takes place by lysis where diathermy is used."

It is noteworthy that Stewart began his work in 1921 unaware of the work of Price and DeKraft who, according to him, were the first to use diathermy in the treatment of pneumonia.

Grunspan de Brancas[6] speaks favorably of the use of diathermy in chronic pleurisy and in chronic bronchitis with and without asthma; pneumonia, however, is not considered. Price[7] and DeKraft[8] do not refer to the use of diathermy in the treatment of pneumonia.

1923

Stewart[9] expands but little on his previous report but calls attention to the fact that diathermy is absolutely harmless when properly used and that as yet he has found no contraindication to its use in pneumonia. Humphris[10] and Breuer[11] recommend its use in pneumonia. Turrell[12] and Cumberbatch[13] in general articles on diathermy do not mention its use in pneumonia.

1924

Stewart[14] reports two years' experience in 120 cases where he points out that the temperature fell by lysis, that there was symptomatic improvement, and that in 36 cases treated with diathermy the mortality was 19.4 per cent as compared with a control group of 21 cases with a mortality of 42.9 per cent. Lacey[15] deals with a small series of cases of pneumonia in children; diathermy was used and in the last eight cases treated there were two deaths. Jackson[16] and Breuer[17] in articles on diathermy in internal medicine do not mention its use in pneumonia.

1925

Stewart[18] cites a series of 41 treated cases with a mortality of 17 per cent as com-

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pared with a control series of 21 cases with a mortality of 42.9 per cent; he also calls attention to the fact that this treatment does not interfere with any other form of therapy but stresses the point that diathermy is not a cure for pneumonia. His technique is clearly set forth in this article. Snow[19] quotes Stewart and emphasizes the fact that diathermy should be used early in the disease; also stating as his opinion that there are no contraindications to its use, even late in the disease. Kessler[20] who summarizes all the work to date and notes that the cases studied are too few to allow one to draw any final conclusions, believes that the fact that temperature falls by lysis is a definite indication of the efficacy of the treatment. Walsh[21] gives the results of his own work: 154 cases, 95 with diathermy, 59 without. Average number of treatments per case 3.4; diagnosis carefully established in all cases—143 had roentgenograms of the chest—all cases received routine medical therapy. Twelve of the 95 cases receiving diathermy died; of the 59 cases receiving no diathermy 12 cases died. He does not feel that these figures have any real significance as the series is too small and too many variables enter in to make it statistically valid. Diathermy is worth using if only for the symptomatic relief. Kobak,[22] Nelly,[23] and Goodman[24] make no mention of pneumonia.

1926

McFee[25] reports excellent results in the treatment of pneumonia by diathermy, with but one death in a series of 17 cases. He stresses the need for individualization of the treatments and careful watching of the patient for signs of depression which would temporarily, at least, stop diathermy treatment. Nagelschmidt[26] in a treatise on diathermy mentions its use in pneumonia and gives one case report. Stewart[27] in a review of his first 3,000 cases treated by diathermy calls attention to the following:

a) The temperature falls by lysis,
b) There is decreased cyanosis,
c) The respiratory rate is lowered,
d) Pain is relieved,
e) Extension of the disease process may and does occur, with, however,
f) Fewer complications,
g) The duration of the disease is not shortened,
h) Resolution is hastened, and,
i) The indications are that the mortality rate is lowered.

Granger[28] in a general article on medical diathermy considers pneumonia as one of the indications for its use, stating:

"Diathermic heat is of value in this disease as it diminishes pain, improves transiently the heart's action, and induces sleep. These factors alone make it a valuable adjunct to other standard or routine methods of treatment. I do not believe that diathermy ever shortened the course of this disease but by relief of pain and increasing the amount of rest it may tide over the patient until lysis, or rarely crisis, occurs."

DeKraft,[29] considering the clinical action of diathermy, does not refer to its use in pneumonia.

1927

Forbes[30] believes that diathermy is of definite value in the treatment of pneumonia in children. The following table is a summary of the mortality and complication percentages as shown in this paper:

	Cases	Mortality	Complications
Lobar pneumonia without diathermy	117	28.2%	49.5%
Lobar pneumonia with diathermy	33	15.1%	38.3%
Broncho pneumonia without diathermy	190	38.9%	67.9%
Broncho pneumonia with diathermy	63	19.0%	49.0%

Forbes, like Stewart, makes the point that diathermy does not shorten the course of the disease and in addition feels that thymus hypertrophy may constitute a contraindication to the use of diathermy.

Otis[31] feels that the response to diathermy treatment is favorable in pneumococcus pneumonia and in post-operative pneumonia, but poor in streptococcus pneumonia. Snow,[32] reviewing the work of others, concludes that diathermy definitely is indicated in all types of pneumonia. Nagelschmidt[33] in an article on the scope of diathermy in medical practice fails to mention its use in pneumonia. Experimental work on the actual heating in the depths of tissue following the use of diathermy is reported on negatively by Lonergan[34] and by Bettman and Crohn,[35] the last named authors stating as their belief that the "skin effect" (an electrophysical term) was the limiting factor in the penetrating power of diathermy. The first four of a series of five articles by Binger and

Christie[36] appeared this same year. This work is a classic in its field and is deserving of considerable attention at this point. In their experimental work on dogs, Binger and Christie bring out the following facts:

"1. The lung temperature in the anesthetized dog normally lies 0.3°—0.4°C. below the rectal temperature. During the passage of diathermy currents of strengths equivalent to those used in therapy this relationship is reversed—the lung temperature exceeding the rectal temperature by about the same value.

"2. Immediately after death, the temperature rises abruptly in the tissue between the electrodes.

"3. Prevention of the access of air to one lung, while its circulation is intact, results in little, if any, change in the rate of heating of the lung by the diathermy current.

"4. Occlusion of a main branch of the pulmonary artery during the flow of current results in a sudden rise in temperature in the lung whose artery has been occluded, with subsequent heating, however, at the original rate. Under these circumstances death of the animal is accompanied by a precipitous rise in the temperature of both lungs.

"5. When the pulmonary veins as well as the artery to one lung are ligated the circulation through the bronchial vessels is also stopped. Diathermy then results in a local rise in temperature in the lung equivalent to that seen in the other lung after death."

It is apparent from this reference that the circulation of blood through the lung is the cooling agent which prevents any significant rise in temperature in the lung during the use of conventional diathermy. Also it is evident that partial decrease in blood supply to one lung (see 4 above) results in some increase in temperature of the lung during diathermy but that when the circulation ceases, as in death, there is a much greater rise in temperature.

1928

Binger and Christie[37] in the fifth article of the series discuss the use of diathermy in the treatment of experimental pneumonia in dogs and conclude as follows:

"1. An experimental pneumonia with more or less lobar distribution has been produced in dogs by the method of intrabronchial insufflation of B. friedlanderi, Type B, and Pneumococcus, Type I.

"2. Such dogs as showed evidence of a pulmonary lesion when photographed by X-Ray were selected for lung temperature measurements.

"3. Measurements of lung temperature were made by means of thermocouples before and during diathermy.

"4. The thermocouples which recorded the temperature in the consolidated lobes showed in most instances a more rapid rate of heating during diathermy than those in normal lobes. The final increase in temperature in the pathological lobes over the normal lobes amounted to slightly more than 1°C.

"5. When local heating occurred during diathermy it was of the order of magnitude found in a lung in which the branch of the pulmonary artery supplying it had been clamped.

"6. Histological examination of the lungs showed the pathological reaction to consist of intra-alveolar exudate composed of polymorphonuclear leucocytes and desquamated alveolar epithelium. In some sections the exudate was sufficient to cause compression and emptying of the alveolar capillaries.

"7. The local heating, we believe, depends upon this ischemic state of the smaller vessels.

"8. Further evidence for an impaired circulation in the pneumonic lung is furnished by injection preparations in which the uninjected area corresponded exactly to the gross pathological lesion."

Again the evidence is that a decreased circulation, whether mechanical or inflammatory in origin, permits of greater heating in the deep tissues by conventional diathermy. That there was impaired circulation in the consolidated lobes was shown by the fact that the injected dye was unable to reach the affected lobes.

Finally in a study of three cases in men Binger and Christie,[38] using a technique similar to that used in the experimental animal with the exception that fewer thermocouples were used and that the intensity and duration of the diathermy treatment was not as great, show almost no increase in temperature in the consolidated lobes during diathermy. However, they call attention to the extreme difficulty encountered in placing the thermocouples in the desired location; they are careful to refrain from drawing too final conclusions from this experiment.

Binger[39] in speaking of the claims made by those who enthusiastically proclaim remarkable results for diathermy in pneumonia calls attention to the pitfalls in the statistical evaluation of any treatment for pneumonia and goes on to say:

"We are far from disputing their claims. We are far from deprecating the importance of empirical observation. To do this would be to fly in the face of most therapeutic discovery. The scientific explanation has usually been *ex post facto*. And yet, to arouse the interest of most scientific workers, some rationale should be sought for, if possible."

His feeling is that the experimental evidence to date does not furnish the "rationale."

Lilien and Echtman[40] believe that dia-

thermy is indicated in lobar and bronchial pneumonia and in many of the sequelae, such as unresolved pneumonia and pulmonary abscess with drainage; they also advocate its use in chronic bronchitis and in asthmatic bronchitis. Clement[41] reports 94 cases treated, with six deaths, and of 88 cases treated early, no deaths. Treatments were given twice daily, for 40 minutes each, the average number of treatments being 6½ per case. Seybold[42] calls attention again to the fact that the temperature in cases receiving diathermy tends to fall by lysis and in addition believes that in early cases where there is no response to diathermy, the prognosis is bad. Hibben[43] advises early treatment, stating that in the stage of red hepatization the improvement will not be so marked, and in the stage of grey hepatization diathermy should be used only if the patient is not too toxic. He also warns against the use of diathermy in individuals who are markedly dehydrated. Alexander[44] feels that the mortality is not as great where diathermy is used; he also calls attention to the immediate relief from pain following the use of diathermy. Stewart[45] in a resume of the results in his own and in other cases notes a lowered mortality and no untoward effects following the careful use of diathermy. Nagelschmidt[46] sounds a super-optimistic note in a lecture on medical diathermy by advocating its use in sundry conditions (pneumonia among them) but fails to support his recommendations with any critical evidence. Vignal[47] cites the work of Stewart and concludes that diathermy should be used with caution, that the treatments should not be too long, nor should the intensity be too great.

1929

A note of skepticism is sounded by Robinson[48] who states that it may be true that diathermy does not heat the lungs, yet he would not advocate discarding its use as a therapeutic agent, and suggests instead "intelligent empiricism." Lyon and Lamb[49] make the point that pneumonia cases tend to get well if not overtreated. They further state that the statistical evaluation of the various methods of treatment of pneumonia is such a fallacious method that it is not worth the effort. Portmann[50] advocates Crile's theory that shock is associated with lowering of the temperature of the liver followed by lowering of the temperature of the brain. Therefore, he believes that using diathermy over the mediastinum and liver will combat shock in postoperative cases where pneumonia appears to be developing. Clement[51] gives four case reports where diathermy "apparently brought about recovery" from pneumonia, presenting the radiographs to prove the diagnosis in each case. Heald,[52] using Stewart's technique, highly recommends the use of diathermy in pneumonia as a sedative measure. In the experimental field, Lueth and Ivy,[53] measuring the secretary response of subcutaneous transplants of pancreas in the dog during diathermy, demonstrate definite subcutaneous heating by this method and conclude:

"(1) One to three degrees F. rise in temperature of the pancreas resulted in a slight increase of secretion in two dogs or no change in one dog, and (2) three to six degrees F. rise in the temperature of the pancreas resulted in a definite decrease in two dogs and either no change or a decrease in one dog. It must be kept in mind that these results apply only to the auto-transplanted pancreas devoid of its original blood supply and extrinsic innervation."

Pariseau[54] devises a good experimental technique for demonstrating the path of the diathermy current and heating in nonliving models; confirms Binger and Christie in refuting the importance of "skin effect," and admits that the cooling effect of the blood stream is an important factor and the lack of it is a weakness in his experiments.

1930

Freeland[55] favors the use of diathermy in the stage of consolidation, early in the stage of red hepatization, and in cases of delayed resolution; believes it is probably contraindicated in the stage of grey hepatization because of the increased absorption of toxic products. Pritchard and Tarbell[56] use diathermy as soon as the suspicion of pneumonia arises and feel that many cases may thus be aborted. Stewart[57] emphasizes the early use of diathermy and finds that influenzal pneumonia responds well to this agent. He further states that empyema and hypotension are not contraindications to the use of diathermy. Lilien[58] advocates the use of diathermy in all pneumonias except aspiration pneumonia, and complications of pneumonia such as closed empyema, pulmonary abscess, and decompensated heart. Robinson[59] reports 89 cases and again emphasizes the sedative effect of diathermy. In this series there were ten deaths which he feels is a low mortality rate when it is considered that the cases occurred during three severe epidemics; the

belief is presented that diathermy is helpful but not specific, nor does it shorten the course of the disease. Snedecor[60] recommends the use of diathermy and oxygen in pneumonia but points out the manifold difficulties in evaluating fairly the mortality statistics in pneumonia; the hope is expressed that some more efficient method may be found for heating the lungs.

1931

Harvey[61] reports a few cases treated showing no contraindication to the use of diathermy. Simon[62] in a small series of cases finds no reduction in mortality nor in the frequency of complications following the use of diathermy; the fact is mentioned that all patients so treated reported more or less relief from pain and preferred diathermy to antiphlogistine.

At this time articles began to appear concerning the characteristics of short wave diathermy[63, 64, 65, 66, 67] but there were none concerning its use in pneumonia.

1932

Leavell[68] evaluates some of the newer methods of treatment of lobar pneumonia, believing that in competent hands diathermy does no harm and does not interfere with other forms of therapy, but questions any reduction in mortality *per se*. Stewart,[69] discussing the recent advances in the diathermic treatment of pneumonia, calls for longer and more frequent treatments and says that pulmonary tuberculosis and rapid resolution with signs of toxic absorption are definite contraindications to its use.

1933

Walsh[70] calls attention to the fact that atelectasis only in recent years has received due attention. Newer methods of treatment in pneumonia aim at increasing the depth of the respiratory movements. His opinion is that diathermy does this well, probably on the basis of the relief of pleuritic pain. Anderson[71] in an article on some of the lesser known applications of electromagnetic radiations in medicine does not refer to the use of diathermy in pneumonia. Terrell, Robertson, and Coggeshall[72] report a series of pathologic studies on experimental pneumococcus pneumonia in dogs; no therapeutic applications, however, were attempted.

1934

Stewart[73] believes that in cases where no response is noted after three diathermy treatments, a fatal prognosis is justifiable. Herbin[74] advocates early use of diathermy, not waiting for X-ray confirmation of diagnosis, in order to abort the pneumonia. Francis and Terrell[75] report the production and clinical course of experimental Type III pneumococcus pneumonia in monkeys, calling attention to variations in the severity of the disease in different animals which seem to be related to variations in individual resistance; diathermy treatment was not used.

1935

Torbett[76] in a resume of all forms of short wave therapy briefly mentions its use in pneumonia. Weatherbee, Foley, and Resnik[77] report:

"A series of thirty-six consecutive cases of lobar pneumonia were given standard treatment for this disease, including serum and/or oxygen when indicated. In addition, one-half of the patients, alternately chosen, were given physiotherapy in the form of diathermy.

"The mortality for the entire series was 22.2%; that of the diathermy group was 11.1%, and that of the control group was 33.3%."

Bierens and Remouchamps[78] state:

"Modern application of short wave diathermy has extended recently to the treatment of various intrathoracic conditions. We carried out an experimental study of the effect of transthoracic irradiation with waves 4 meters in length which in rabbits appear to effectuate a fall in blood pressure and a rise of the respiratory amplitude.

"In healthy men we could likewise observe a fall in blood pressure and a rise of respiratory excursion. We could prove that the lowered blood pressure maintains itself up to 45 minutes after irradiation. The same holds for the effect on respiration."

Schwarz[79] believes in the immediate institution of diathermy once one suspects pneumonia. This author does not favor waiting for X-ray or sputum determinations; reports 18 cases—18 recoveries. Jenkins[80] feels that diathermy is indicated in all forms of pneumonia except where the patient has a pulmonary tuberculosis. The statement is also made that the symptomatic relief alone justifies its use; 103 cases are reported with a mortality of 7.76 per cent.

1936

Schmidt[81] in a preliminary report of the use of electromagnetic induction in the treatment of pneumonia calls attention to the marked relief from cyanosis, dyspnea, and pain following the first treatment. A normal temperature is usually found about 80 hours after the first treatment; the point is also

taken that treatment should be continued until the chest is clear. Stewart[82] feels that diathermy in the last fifteen years has:

"Proved of steadily increasing value as an adjunct in the treatment of pneumonia. Symptomatic relief, justifying its routine use, is attested to by every writer on the subject. Mortality is reduced by an average of about 70%. Cases treated early show the best mortality drop."

Oxer[83] reports one case with three recurrences where diathermy was used successfully each time.

1937

Price[84] believes that the reports on the use of diathermy in the treatment of pneumonia are sufficiently encouraging to warrant further trial of the method. Fitzgerald[85] reports a series of 80 cases where diathermy was used. There were ten deaths in this series, or a mortality rate of 12.5 per cent, four of these deaths were not directly due to the pneumonia, so if these are omitted the mortality rate is only 7.5 per cent. Symptomatic relief and the improved mortality rate following pneumonia are emphasized. Torbett,[86] using short wave diathermy, believes that no more than twelve thirty-minute treatments should be given as too long and too frequent treatments tend to cause delayed resolution. Occasional spreading of the disease even while the patient was under treatment was noted, but the author feels that short wave diathermy is good supportive therapy. Kerlin[87] states:

"If diathermy did no more than increase and promote sleep it would be worthwhile besides taking into consideration the beneficial psychic effects on the patient. . . . Should signs of fluid accumulation appear diathermy should promptly be discontinued as further application will have a tendency to increase the exudate."

Hinshaw[88] feels that diathermy is harmless when properly administered but that there is no proof that mortality is lowered by its use.

1938

Coulter[89] calls attention to the fact that short wave diathermy is more easily applied and therefore more suitable for use in the treatment of pneumonia. In his clinic, electromagnetic induction is the method of choice, a fixed pancake (coil in a flat disc holder) being used over the pneumonic area; this may be done with a minimum amount of disturbance to the patient. Concerning the effects of medical diathermy on the patient, Coulter states:

"From our study of the temperature, pulse and respiration charts and leucocyte counts, there was no evidence of a specific response to medical diathermy. We have observed that in the management of pneumonia, medical diathermy does seem to be of definite benefit in reducing the severity of the thoracic pain.

"This symptomatic relief is often important. The main factors concerned in the production of anoxemia are the passage of blood through the unaerated portion of the lung and shallow breathing. The shallow breathing may be due to pleuritic pain restricting the respiratory excursions. The relief of this pain by diathermy increases the respiratory excursions and this may be the explanation for the decrease in cyanosis that is usually noted.

"Sloan believes from our cases that there is a suggestion in the early cases that medical diathermy may have an effect on the pneumonic process. Bazett notes that the activity of leucocytes in phagocytosis is probably greatly modified by temperature. The locomotion of leucocytes in vitro is certainly so affected. The maximal velocity is reached at 104°F. . . . These facts offer suggestions as to the possibility of an influence of medical diathermy on an early pneumonic process by its stimulating effect upon the body's natural defenses against the organism.

"Therefore, it is believed that diathermy is not a specific cure for pneumonia; that we have not accumulated sufficient clinical evidence that it lowers mortality; that while there is a suggestion of its value, we have no evidence to prove its effect upon pneumonia. It is a helpful adjunct in the treatment of pneumonia because it is the best method for the application of deep heat."

Gotten and Ching[90] hold much the same point of view as Coulter. They point out the danger of burns from the use of diathermy but state that with care on the part of the operator this may be reduced to a minimum.

Bethea[91] has never prescribed diathermy but has observed its use in patients he has seen in consultation and states that it has no unfavorable effects. Cassidy[92] recommends diathermy whenever possible for the symptomatic relief it affords and because of the fact that the termination of the case is often by lysis rather than by crisis.

Frelich and Coe[93] do not favor the use of diathermy in the treatment of pneumonia, pointing out that the effect is mainly confined to the chest wall and that any heating in the lungs is slight. They question, in fact, whether heating of the lungs is desirable.

DISCUSSION

It is apparent from this review that there are widely divergent views expressed on the value of medical diathermy in the treatment of pneumonia. Striking is the paucity of care-

fully controlled clinical and experimental studies that are so necessary before any type of therapy may gain a permanent place in the armamentarium of the medical profession. As far as the author has been able to discover, the excellent work of Binger and Christie in 1927-8 stands alone as the only significant experimental study in this important field. On the basis of their work it would seem that medical diathermy has little to offer the patient suffering from pneumonia. However, attention should be called to the fact that conventional (long wave) diathermy is not as effective a means of heating the deep tissues as is short wave diathermy and that their work was done with the former. Thus it is evident that experimental investigation has not kept pace with mechanical improvements; the modern methods continue to suffer from the condemnation of the older methods.

The observations reported in the articles that have been reviewed may be divided into three groups: (1) Objective observations where facts are noted and there is little room for opinion; (2) Objective and subjective observations where fact and fancy may be mingled in varying proportions; (3) Subjective observations where opinion plays the major role.

(1) *Objective Observations:*

Most writers report that temperature falls by lysis in pneumonia cases treated by diathermy. Such a course is almost the rule in bronchopneumonia regardless of treatment, but temperature fall by crisis is one of the dramatic features of the typical lobar pneumonia. Reduction in cyanosis following the use of diathermy is another important observation that has been made by many. Coulter offers an explanation for the mechanism underlying this phenomenon. The emphasis on the value of early treatment is logical but at the same time permits of some qualification. A number of authors advocate using diathermy before the diagnosis is definitely established. Such a procedure is commendable from the patient's point of view but leaves much to be desired from an investigative angle. Who is to say that the patient really had lobar pneumonia if, after a few diathermy treatments, he is up and around and there is no X-ray or sputum study to prove the diagnosis? While one naturally hesitates to suggest that no treatment should be given until the diagnosis is established beyond all doubt, still, for purposes of evaluation of the effectiveness of any form of therapy, a definite diagnosis is mandatory.

The mortality rate would seem to be an objective method of study, and for many conditions it may well be. Pneumonia, however, is a protean disease. It is difficult to predict the course in any individual case and the evaluation of a series of cases is even more complicated. The reason for this is that there are multiple factors entering into any given case that make the direct comparison of that case with another a rather difficult task. Therefore, we are not justified in stressing the so-called improved mortality rate as a point in favor of the use of diathermy, for with few exceptions there has been little attempt to run a controlled series of cases.

(2) *Objective and Subjective Observations:*

The duration of the disease is not affected by treatment with diathermy, according to many of the writers; others claim that its course is shortened, and some state that it may even be aborted through prompt use of diathermy. How may these views be correlated and brought to a common denominator? It is possible that those who claim to be able to shorten the course of the disease may not use the same criteria in evaluating the patient's progress as those who do not make such a claim. In the case of those who state that the disease can be aborted, we may well question the accuracy of the diagnosis.

On the matter of contraindications to the use of diathermy there is no general agreement. The majority of the writers indicate that late in the disease (the stage of grey hepatization) the use of diathermy may result in a significant increase in the absorption of toxic products so that the treatment must be discontinued. There is apparent accord on the fact that empyema without drainage and pleural effusion may be contraindications to the continuance of diathermy treatment. Possible contraindications, such as advanced cardiac decompensation and advanced age, have received but scant attention to date.

(3) *Subjective Observations:*

Individualization of the treatments is a point well taken and one that deserves great emphasis. The key to many of the questions to which we have already referred may be found in this direction. For example: in one case pleural effusion may be benefited by the continued use of diathermy, whereas in the next case, pleural effusion may indicate the discontinuance of the treatments. While it is

necessary to have some plan for frequency, intensity, and duration of treatments, yet a routine procedure suitable for all cases of pneumonia certainly is not advisable. Each case must be treated on its merits.

The number of treatments to be given in any one case may not be categorically stated. Schmidt advocates continuing treatment until the chest is clear; others feel that too prolonged a series of treatments does not favor early resolution. The only safe rule appears to be that each case must be a law unto itself.

Most of the writers feel that there is marked symptomatic improvement following the use of diathermy. Wishful thinking on the part of the patient and the physician makes this a most difficult observation to evaluate. However, the observation is so generally made that its frequent repetition deserves consideration. Some enthusiastic writers have gone so far as to say that where no response to the first few treatments is noted the prognosis is unfavorable. In the opinion of the author such a statement must await confirmation and at the present time should not influence our attitude toward any given case.

CONCLUSIONS

Medical diathermy appears to be of value in the treatment of pneumonia, regardless of anatomical distribution or etiology. The more modern techniques, especially electromagnetic induction, are easy of application, disturb the patient little, and do not interfere with any other form of treatment. The value of diathermy to date, however, rests wholly on an empirical basis. In fact, were it not for the advance in design and application of diathermy apparatus and its proven greater heating ability when applied to such areas as the thigh, the author would be forced to conclude that the work of Binger and Christie makes the value of diathermy in intrathoracic conditions questionable.

There is urgent need for carefully controlled experimental studies on animals where the newer methods of medical diathermy may be evaluated in the most objective manner possible. Equally carefully controlled clinical studies are needed where these same methods may be evaluated and where due regard is given to all conditions, such as physical status, other forms of treatment, and to the establishment of a definite diagnosis. Coulter[71] favors the type of investigation where one clinician gives the treatment while another clinician makes the observations on the case without knowledge as to what type of treatment that particular patient is receiving. This type of evaluation is highly commendable and least subject to the sin of wishful thinking. Standard diagnostic criteria, such as physical diagnosis, roentgenograms, sputum typing, and so forth, should be adhered to rigidly throughout the course of the disease.

Finally, there should be less unfounded optimism on the part of those in the field of physical therapy, and more scientifically minded determination to uncover the truth regardless of whether the end result is favorable or unfavorable to the use of medical diathermy in the treatment of pneumonia.

It is the author's hope that this review will serve to stimulate further interest in this important field and especially encourage well controlled experimental and clinical investigation.

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The Crippled Children's Program

State of Washington

H. J. Wyckoff, M. D.

For a number of years it has been possible for the crippled child, from birth to fourteen years of age, to obtain hospital or clinic care in this State. The first work of this sort was started by a group of women in January 1907, over thirty-two years ago. At that time a ward of eight beds was furnished at the Seattle General Hospital and the following year a small frame cottage was built on the present site of the Children's Orthopedic Hospital. There has been a gradual growth since then and at the present time we have an institution covering an entire block, with buildings and equipment valued at more than $1,000,000.

At the time that the Shriners became interested in work for crippled children, a mobile unit was started at St. Luke's Hospital in Spokane, and it is understood that plans are now being made to build a small hospital of their own.

More recently small orthopedic wards and clinics have been developed in the Tacoma General Hospital in Tacoma, and at St. Joseph's Hospital in Bellingham.

For a number of years there has been a need for some means to care for the crippled children over fourteen years of age. In the past the orthopedic surgeons have donated their services, while various groups or organizations have raised funds to cover the hospital and other expenses. Obviously this was very unsatisfactory as the necessary aftercare frequently could not be carried out and a number of children in need of care were never able to make the proper contacts or arrangements.

The State Legislature, in 1935, made the present crippled children's program possible by voting funds for this work which were later matched by Federal funds. With suggestions from the Children's Bureau in Washington, D. C., and plans from other states, a program was developed. In studying the state organization, there is first the governor, then the director of social security who is responsible for the division of children, the division for old age assistance, the division for general public assistance and the division for the blind.

Under the division for children, there is the services to crippled children, child welfare services, aid to dependent children and the inspection and licensing of boarding homes and institutions.

Although we all feel that the crippled children's program is very important, we must realize there are a number of other groups needing asistance as well, and the funds for our work necessarily are limited. It was thought advisable to use the existing agencies wherever possible, and by so doing we have been able to care for many more children than would have been possible without their assistance.

The actual work started in January 1936, when clinics were held in some nine cities over the state. Since then clinics have been held at regular intervals. To date 2,123 children have been examined: 802, or 38 per cent, have been referred for orthopedic treatment; 696 of those were found eligible; 592 have received treatment or are under treatment at the present time. There are 104 still waiting for treatment.

The actual treatment of the crippled child is carried out by sixteen orthopedic surgeons and five plastic surgeons. From this group an orthopedic advisory board is selected and there is also a medical advisor or orthopedic consultant. All of the orthopedic surgeons have passed the necessary requirements for, or are members of, the American Board of Orthopedic Surgery.

These cases are cared for in four different

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centers: at the Swedish Hospital in Seattle, where a new wing has been constructed for this work; at the Tacoma General Hospital in Tacoma; at St. Joseph's Hospital in Bellingham; and at the Sacred Heart Hospital in Spokane. All of these centers except Spokane have well equipped physical therapy departments with pools for water work. All except Spokane have well trained and recognized physical therapists in charge of these departments. Ten members of the orthopedic staff have well equipped physical therapy departments in connection with their offices and employ well trained physical therapists, all members of the American Physiotherapy Association. The physical therapy work on the cases under the State Crippled Children's Program may be done either in the hospital centers or in the orthopedic surgeons' private departments.

The orthopedic surgeons as a group have, for a number of years, recognized the value of physical therapy, either as the primary treatment or as follow-up treatment on surgical cases. We realize that the excellent work done by the physical therapists and the interest which they have shown have been responsible for the excellent results we have been able to obtain on a great number of our cases. We also feel that by their efforts and cooperation we have been able to shorten the convalescence in certain cases, thereby increasing the numbers which could be treated under this program.

The cases which have been treated so far have included the usual types seen at any orthopedic clinic, such as infantile paralysis, osteomyelitis, scoliosis, tuberculous joint disease, arthritis, traumatic deformities and congenital conditions of various forms. We have examined a number of spastics, but have recommended treatment for very few, feeling that with our present equipment we could do very little for these cases. A few of the states have developed centers for spastics under the Crippled Children's Program, and we are investigating this work, hoping to be able to start a similar program in the state of Washington in the near future. We wish to carry out work along this line, suggested by Dr. E. R. Carlson of New York City. As you probably know, he believes that the best results can be obtained by careful supervision of the spastic child's activities throughout the entire day. He does not favor treatment, either in a hospital or in a school with normal children. Teachers and physical therapists are receiving special training in teaching and treating the spastics and are obtaining remarkable results in favorable cases. Due to the fact that so many spastics have speech defects, daily speech training by someone familiar with this work is made part of the daily routine. I would favor having a center, in or near Seattle, with quiet and pleasant surroundings where these spastics could be kept for a long period, given careful daily supervision of their activities, regular classroom work by special teachers, regular physical therapy and speech training where needed. I believe some such institution could be developed where both the private and clinic cases could be treated.

The Division of Children, in our State, now has a clinical psychologist on its staff, so we may have a character study and mental rating, which often is of great value in outlining our treatment or offering a prognosis on an individual case.

In addition to the medical and surgical care, there are various other activities carried out in the different centers for the development and entertainment of the children. In all of the centers the school boards have been very cooperative in furnishing teachers, so that the children may carry on their regular school work. Various organizations have arranged entertainment by furnishing radios or supplying musical and other types of programs to occupy the time when the children are not doing their regular school work. In addition to this there is a vocational rehabilitation program which is just getting started. This is of especial importance to the older children as it will be necessary for at least some of them to be self-supporting. By training them in an occupation or profession which they can carry on in spite of their physical handicap, it will be possible for many of them to be self-supporting and, in some cases, they will be able to compete and out-distance the normal individuals. We always remember Steinmetz, who in spite of an extreme physical handicap, was director of all research work for the General Electric Corporation for a number of years.

Regardless of what happens to the general Social Security program in the future, there

is no doubt in my mind that the crippled children's program will continue. In bringing the program to this point we have made some mistakes, but on the whole the results have been satisfactory. We are constantly making changes so that as time goes on we are able to accomplish more with less effort, and, we hope, in time to have a machine that will run smoothly and to the complete satisfaction of everyone.

A Study of Physical Therapy Costs in Industrial Medicine

Ralph Highmiller, M. D.

The industrial insurance and medical aid laws of Washington differ from the laws of several states for the reason that in some states it is optional with employers whether they insure their workmen with the state or with other agencies, whereas the Washington laws are monopolistic in character, requiring employers to insure their employees with the state only.

The monopolistic features of our industrial insurance and medical aid laws create a great volume of business to be administered by the Department of Labor and Industries and because of that volume of business, it was possible for the department's statistical division to compute accurately the average cost per claim of each type of treatment averaged over a great number of claims. Early in 1937 Director E. P. Kelly caused a statistical report to be compiled showing the average cost per claim for each type of treatment for the year 1936. The report revealed the startling fact that, with the exception of "hospitalization," physical therapy averaged a higher cost than any other type of treatment. To be exact, the average claim cost per item was as follows:

Hospitalization	$38.53
Surgical Treatment	11.49
X-Rays	7.30
Physical Therapy	15.46
Special Examinations	13.70

Director Kelly and the department medical division recognize the value of properly administered physical therapy and other reconstructive treatment, but the facts in the statistical study showed conclusively that in spite of the huge amount of money spent for that type of treatment, workmen benefited little therefrom. Accordingly the department could conclude only that much of the work was being done by incompetent persons or that competent ones were not properly doing the work for which they were being paid. Thereupon, with no intention of discounting the value of such treatment, the Director ordered closer supervision over that type of service. He adopted a policy of requiring physicians to obtain written authorization from the department before rendering physical therapy treatments and limited the number of treatments to a maximum of six on a single authorization. If more than six were needed, physicians were required to apply for additional authority.

Physicians in general did not take kindly to the restrictions placed upon that type of treatment but necessity demanded that the restrictions be imposed. However, the ruling had a good effect and the indiscriminate giving of physical therapy was checked. It also gave rise to a study of the problem which revealed the correctness of the department's opinion that the majority of physical therapy treatments were being given by inexperienced persons, indiscriminately for conditions where it was not indicated. Usually the treatments were no longer than 15 minutes and often the claimant experienced none or little improvement. The charge for a physical therapy treatment given by an inexperienced person

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was the same as that for a treatment given by a trained and experienced physical therapist, the amount being $2.00.

During the year 1937, $12,613.30 was spent for physical therapy on departmental cases. The average per claim was $13.03. This made a reduction of 16 per cent in the cost of physical therapy per claim as compared to 1936 expenditures, and better results were obtained in 1937 than in 1936.

It is not the intention to discriminate against any division of the medical profession, but the department is determined, as far as possible, to see that services are performed by those who are most competent.

In 1938 an attempt was made to alleviate the situation and new rules were formulated to take care of the problem. The medical advisers of the department, recognizing the value of physical therapy when given for the indicated conditions, at the proper time and by experienced trained persons, urged the adoption of the program which is now in effect:

1. Physical therapy given by registered physical therapists—$2.00 per treatment.

2. Physical therapy given by one who does not meet the requirements of the American Registry or the Washington Chapter of the American Physiotherapy Association—$1.00 per treatment.

3. On cases where the attending physician feels that physical therapy is definitely indicated, the department will specify by whom the service is to be rendered. Considering that best results can be obtained only when the service is given under correct supervision by one versed in the art, this will be taken into consideration when authorization is given.

4. The physician making the request for physical therapy treatment should state his own qualifications and facilities or those of the physical therapist to whom he may suggest that the workman be referred, in order that the department may pass upon same and state the fee to be paid when granting authorization.

The merits of this program are as follows:

1. The indiscriminate giving of pseudo-physical therapy is discouraged.

2. Physical therapy treatments given by registered physical therapy technicians assures the claimant adequate treatment for the condition requiring the therapy.

3. Registered physical therapists are compensated in regards to their ability and non-registered persons accordingly.

4. The improved standard of therapy assures satisfactory results, economy in medical costs, savings in time loss, economy of earning power, and reduction in disability awards.

5. Hospitals and clinics find it advisable to employ only trained, experienced, registered physical therapists.

6. The average cost per claim for physical therapy for 1938 was $10.90, or a 30 per cent saving as compared to 1936. This program has been in operation only the last four months of the year and in spite of the reduced cost the rehabilitation results were far more satisfactory than for 1936 and 1937.

Since this program has been in effect, there has been need for placing capable, trained physical therapists throughout the State of Washington.

The Department requires only that persons giving physical therapy treatments meet the requirements of the Washington Chapter of the American Physiotherapy Association, in order to receive the $2.00 fee allowed for physical therapy treatments. Others not qualifying are allowed the $1.00 fee. By improving the standards for the giving of such treatments, it has enabled persons belonging to the Association to practice their profession in a satisfactory manner and also it has reduced the tendency to infringe on the work that properly belongs to those trained in the science.

In conclusion the department wishes it to be clearly understood that the differentiation in fees was not established for the purpose of creating a means of obtaining service at the reduced price of $1.00. On the contrary, the $1.00 fee was adopted for the principal purpose of discouraging incompetent persons from performing that type of service at all. As a matter of fact, the department hopes that in the near future it will cease to receive bills for $1.00 service, and that all physical therapy be done by persons who are qualified to charge the preferred $2.00 fee.

Pseudo-Hypertrophic Muscular Dystrophy

Howard Douglas John Fabing, M. D.

The following remarks on this disease have been taken bodily from an unusual source:

"The disease is one of the most interesting, and at the same time most sad, of all those with which we have to deal: interesting on account of our powerlessness to influence its course, except in a very slight degree, and on account of the conditions in which it occurs. It is a disease of early life and of early growth. Manifesting itself commonly at the transition from infancy to childhood, it develops with the child's development, grows with his growth—so that every increase in stature means an increase in weakness, and each year takes him a step further on the road to a helpless infirmity, and in most cases to an early and inevitable death.

"These facts do not render its study a matter of less importance. Because we can do little by our treatment, it is not the less necessary to be able to recognize the disease when it occurs, and to know the little, and to know how little, we can do. Moreover, regarding every disease now incurable we may entertain the hope—faint it may be with respect to some, stronger in the case of others—that our powerlessness may not be permanent, and that we, or those who come after us, may be able to speak in very different terms."

The above are the opening remarks of a lecture on this disease delivered to students of University College, London, at the National Hospital, Queen Square, in the year 1879—practically sixty years ago. The lecturer was Sir William Gowers, the greatest neurologist of his time—perhaps of all time.

What he said that day is equally true today: it is a most interesting disease but most sad because it affects young children and actually grows, it seems, as they grow, so that each year finds them bigger but weaker until a premature death removes them. The fact that we can do but little for them, however, is no reason for us to lose interest in their diagnosis because we believe, as Gowers did in his Victorian day, that successful treatment of this malady may be just around the corner.

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Read before the Ohio Chapter of the American Physiotherapy Association, Cincinnati, Ohio, October 15, 1938.

What, then, is the clinical picture of this disease? What are its salient features by which it may be recognized?

It is a distinctive disease of muscles, with many striking characteristics. Its diagnosis is made, not by involved and puzzling laboratory procedures whose intricacy leaves us wide-eyed with wonderment, but it is made by the simple process of using the eyes and hands which God gave us. There is no doubt that physical therapists, who constantly observe the appearance, the station, the gait, and the movements of children, can diagnose this condition more readily than the average physician if the characteristics of the malady are but borne in mind.

A typical case history will best describe the disease: Our patient is a boy of nine years. His oldest brother, aged 16, is bedridden with this disease. Two other brothers and a sister are healthy. His parents are healthy. There is a vague history that his mother had a brother who died at the age of nineteen with a paralyzing disease of this kind.

The first thing which attracts our attention about this lad is his peculiar attitude and gait. He stands with his shoulders and head thrown back and legs apart, as if balancing himself, but without unsteadiness, although a slight impulse will throw him down. His mother, who is with him, says that "you can knock him over with a feather," and that he is clumsy and continually falling down at home. This backward carriage of his shoulders apparently is due to a marked curvature of the spine in the lumbar region with the concavity backwards—a lordosis. But this curvature is not permanent; if he sits down it disappears—in fact, his spine now curves the other way, with the convexity backwards, and he sits in a hunched position. His head, too, is forward now. His spine appears more than usually flexible—almost "rubbery" in its wide movement.

Next we have him walk. If we are quick, and if we have skilled ourselves in the art of observation—the art of looking at things intelligently—we will see an unusual thing when he gets out of his chair. He puts his

hands firmly on the arms of the chair—or if it has no arms, he puts his hands firmly on his knees. Then he inclines forward and slowly raises himself to the standing position by straightening his arms as he rocks forward. If we are good observers, we make a mental note that our patient got out of the chair not like a nine year old boy but exactly like a tired, feeble old man of eighty.

He is now standing in his peculiar fashion, and we have him walk. If we continue to use our eyes we see that he does not walk, but he waddles. His pelvis seems to tilt to the left when he steps on his left foot, and to the right when he brings down his right foot, so that he rolls from side to side like a sailor if we view him from in front or behind.

If we view him from the side, however, we see something which strikes us as almost humorous. We see a gait which is strangely reminiscent of the vaudeville stage—the gait of the comedian who is mimicking the fat, pot-bellied, overly-fat small town politician. Or if we do not remember the vaudeville stage, we may compare our patient's manner of walking to that of Mr. Donald Duck, a character whom we all know. What are the characteristics of this gait, if we analyze them? The knees are lifted higher than normal, the feet slap to the ground as though our patient wore snow shoes, his abdomen protrudes forward, his back is bowed in lordosis, his shoulders and head are back, and his arms swing through wide arcs as though he were swimming with them.

There is no other gait like this. The late Dr. W. J. Adie of London, who had an extraordinary gift of phrase, called this the "aldermanic" gait, the gait of the fat alderman.

Another thing we see by just looking at our patient is his peculiar face. It has been called the "myopathic facies," so typical is it. We note that his jaw muscles are large, and that his lips are excessively puffed and he cannot move them fully when he laughs or when he pouts.

We now disrobe our patient and inspect him more minutely. We note that his calves are extremely large, his thighs thin, his buttocks large, his back muscles thin, so that the spinous processes of his vertebrae stand out like so many gumdrops. His deltoids and infraspinati are huge, his lower pectoralis and latissimus dorsi muscles seem to be completely gone, his upper arms are thin, his forearms and hands normal.

We feel his huge calves and note that they are extremely hard. They feel like a new tennis ball instead of normal muscle. The same holds true for all the other big muscles. We realize that these muscles are tight, are in a state of partial contraction. This is most marked in the gastrocnemius and soleus, and his Achilles tendons are so taut that his heels do not quite touch the floor.

We next have our patient get up from the floor. The manner in which he does this is so characteristic that most writers regard it as a pathognomonic sign. We have him lying on his back. We tell him to get up. First he rolls over on his abdomen. Then he gets on his hands and knees. Then he changes to a hands-and-feet posture. Then he places his hands on his knees. Then he literally climbs up his thigh with his hands until he is erect. An analysis of his sequence of movements discloses that the patient, by shifting his weight, converts his femurs into more efficient levers. This is necessitated by his unusual weakness in his anterior thigh musculature.

The distribution of hypertrophied and atrophied muscles varies somewhat from case to case but in general the total appearance and total motility pattern of all these patients is strikingly similar. Thus it becomes evident that by using one's eyes and hands this diagnosis is made. It can be verified by a microscopic study of a biopsy section of affected muscle.

We now turn to a consideration of other factors in the disease. In its etiology it seems to be definitely familial in at least half the cases. In the other half, the cases seem to be isolated—that is, they appear in a family in which the disease is not evident in other members. This is important to know, for we can tell a mother that if her first-born develops pseudo-hypertrophic muscular dystrophy, there is a reasonable chance that it will appear again in later children. It seems to be inherited mainly from the maternal side but shows up in the males about six times as often as in females. This tendency for the healthy mother to carry the disorder to her sons does not occur with the constancy found in such a disease as hemophilia but in an appreciable number of cases the heredity is sex-linked.

The pathology of the disease is confined to muscles. At one time it was thought that the nervous system, especially the spinal cord, was diseased as well, but careful study fails

to substantiate this. If one cuts into one of these over-large, hard muscles, like the gastrocnemius, it is difficult to believe that the section is that of muscle. Its appearance is precisely that of a fatty tumor—a yellow greasy mass of fat in which there is little or no trace of the normal muscular redness. Under the microscope, there is also a resemblance to a fatty tumor. Large fat cells are present throughout. Passing among the fat cells, however, are strands of fibrous tissue and muscle fibers. There is more fibrous tissue than normal, and the muscle fibers appear more commonly swollen or shrunken than of normal size. A section of muscle which appears atrophied rather than hypertrophied, such as the latissimus dorsi, appears to contain less fat and more fibrous tissue.

What is the prognosis in these cases? Usually the disease makes its appearance early, commonly at the time when the child begins to walk. It is progressive, leading to a chair-ridden or bed-ridden existence in a few years. Death usually occurs between the tenth and twentieth year. Since the muscles of respiration are involved along with others in this insidious progressive weakening process, the normal aeration of the lungs becomes impaired, and death almost invariably comes from bronchopneumonia which follows an otherwise ordinary cold in the nose. However, in occasional cases, more common in the female, the disease progresses more slowly and even seems to stop after it has gone so far. These people live a longer span of life.

What treatment have we for these children? At one time arsenic and phosphorus were used. These drugs have been abandoned. Ephedrine and glycine are now used, with dubious benefit. The most valuable treatment at hand is physical therapy. The use of electrical stimulation, whether faradic or galvanic, is of dubious benefit. Most investigators condemn galvanism completely and have little faith in faradism. The use of simple massage, active and passive exercises, and exercise in water, however, are of great benefit in preventing contractures and in reducing the discomfort in contracted muscles. It is suggested that the patients be kept on their feet as much and as long as possible, and that they seek out a climate which is warm and dry in order to avoid the upper respiratory infections which so often end in death by pneumonia. Occasionally tenotomy is of value, in lengthening shortened tendons, and mechanical appliances are valuable in allowing the patient to get around for a longer time than he ordinarily would.

SUMMARY

Little progress has been made in our knowledge of this disease during the past century but there is a very real hope that present day research may disclose a more adequate therapy. The diagnosis is made by clinical means, by observing the patient. Because physical therapists constantly watch the gait, station, and movements of children, they are in a better position to diagnose this malady than is the average physician. A typical case history is cited, and the etiology, pathology, prognosis, and treatment are discussed briefly.

A visit to the baths of Bath in the late Sixteenth Century was not to be undertaken lightly. Besides the tediousness and discomfort of several days' journey, there was the necessity of a considerable amount of preparation.... Much luggage had to be assembled, for besides personal necessities supplies of various kinds had to be arranged, both for the journey and for the residence in Bath. Some visitors had a "dyslyke of the townes drincks" and provided their own ale or beer, in spite of the risk that "it may be stale at your repayr thither." Bed-hangings, plate, wood and coal were also necessary. Several carts would be required for the carriage of this equipment, and four were requisitioned by the Lord Chamberlain (Earl of Sussex) in 1578 "to carry his stuff from Norwich to London and so to the Bathes."—*From "The Baths of Bath" by P. Rowland James.*

Circulatory Diseases of the Extremities and Their Treatment

C. S. Lakeman, M. D.

During the past decade rapid progress has been made both in the diagnosis and management of diseases of the peripheral vessels. Many accurate clinical and experimental observations and many new discoveries over this period of time have resulted from a widespread interest in these conditions. In almost all hospitals, special clinics have been established for the study and treatment of patients suffering from various forms of vascular insufficiency. These new methods of diagnosis have made it possible for us to estimate more accurately the extent of involvement of the extremity and have improved forms of treatment for restoring to function some of those extremities which in the past were amputated.

Nevertheless, with all the research and careful observation of patients, no single medical or surgical procedure has proved adequate to meet these conditions, and physical therapy has become a very necessary addition to the treatment of these patients. There has been an actual increase in the number of patients presenting themselves with evidence of vascular insufficiency. This is a very real condition and is due to several factors, such as improvements in general health which give longer life, improved treatment of diabetes, and fewer deaths from accidents. All these factors are bringing more people into that age group where vascular changes manifest themselves.

Circulation of the extremities has both local and general functions. The local functions consist of providing to the tissues of the extremity those substances which are needed and removing from the extremity the products of metabolism. The resting extremity requires little blood, but the muscle when in use makes large demands. The blood stream must also carry to the extremities the necessary forces with which to combat infection or injury.

The extremities play two parts in temperature control. The circulation in an extremity must be adjusted so that the extremity is not injured by environmental changes; it also plays a large part in maintaining the body temperature, as the surface of the extremities comprises about two-thirds of the whole body. The rate of blood flow is regulated chiefly by the vasomotor nerves acting through the central nervous system on the small arteries (arterioles) plus a mechanism known as the arteriolo-venous anastomoses. From the above we can readily understand the importance of maintaining a good circulation in the extremities, not only from the point of view of local requirements but from the needs of the whole body.

Methods of Diagnosis

The diagnosis of these conditions in the majority of cases is and can be made on the history and physical examination alone. A careful history is very important; close questioning often will reveal an onset two or three years prior to the date originally fixed by the patient. We must inquire concerning pain, when first noticed, character of it, the site of it, and the time of occurrence, whether resting or following exercise. Typical claudication means exercise pain relieved by rest. Patients may describe either fatigue or pain of calf muscles after walking or dancing, quickly relieved by rest. Many of these patient's are treated for varying periods with arch supports and special shoes. Rest or night pain is indicative of a serious deficiency. The patients are questioned concerning numbness and tingling in the extremities, the effect of temperature changes on their symptoms. The use of tobacco is recorded as to number of years and daily consumption. The age, sex, and nationality are all recorded.

Examination: Following a complete general examination, including laboratory procedure, such as blood counts, blood sugar, and Wassermann, we turn to the examination of the extremities.

With the extremity in the horizontal posi-

16 N. Goodman Street, Rochester; and Rochester General Hospital, Rochester, N. Y.

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tion, we note the color and the texture of the skin, whether it is dry, moist, or thickened. Notice the condition of the nails, whether thick, brittle, or deformed. Often patients will volunteer the information that they seldom have to cut the nails on one foot. This is an indication of poor nutrition. The superficial veins are examined for evidence of phlebitis or marked enlargement of veins in one extremity. Edema of the extremities must be noted. The feet are inspected carefully for any areas of superficial infection around the nails, any trophic changes, such as ulcers or small areas of gangrene.

The temperature of the extremities should be estimated by the examiner's hand, the two extremities being carefully compared, noting any difference in the two and any variation in one extremity at different levels. This is best done by using the dorsum of the hand.

The time of capillary return means estimating time required for color to return to an area of skin in which blanching has been produced by pressure of the finger. The exact value of this is questioned by some, but it seems to be of some help along with the rest of the examination.

The extremity is next elevated to about a 60 degree angle until the foot becomes white, the time required for this being noted, as an extremity with poor arterial supply obviously will become blanched more quickly. Following this, as the leg is lowered, it is well to note the point at which the foot again assumes a pinkish color. That point is known as the angle of vascular sufficiency. With some patients this will be in the horizontal position or a little above it. With others it is necessary to lower it below the horizontal position to obtain this result. This gives us an indication of the position best suited for this patient in bed. These extremities with arterial deficiency never should be elevated, although this has been a common practice and still is in many places. Some patients give the history that they have, for some time, obtained relief from their pain at night only by allowing the extremity to hang over the side of the bed. The leg is now brought into the dependent position and the extent and distribution of rubor noted. This reactionary rubor is due to stasis of blood and indicates the failure of the small arteries, arterioles, and arteriolo-venous anastomoses to function properly.

Pulsations in the extremities are palpated, the two extremities being compared. In the lower extremity, the femoral, popliteal, dorsalis pedis, and posterior tibial readily can be found in the normal individual. In the arm, the brachial, the radial, and the ulner arteries are palpated. These vessels are examined for evidence of thickening or nodules.

Special Procedures Used: You will note that all examinations so far can be done with the eyes and the hands. You people who see a number of such patients should observe many of these things and, in doing so, you frequently can call to the attention of the attending physician abnormalities which he perhaps has not noticed or changes which have occurred since treatment was started.

One of the forms of examination requiring special equipment is the estimation of the surface temperature of the extremities. This is probably the most practical method we have of estimating the flow of blood through an extremity. The question arises here as to the value of a constant-temperature room. These rooms are built so that a special heating unit maintains the temperature and humidity at any constant level. The principle, of course, is obvious; you will recall that under the functions of the extremity we pointed out both the part that the extremities played in maintaining the temperature of the body and the effect the temperature changes had on the vessels of the extremities. A constant-temperature room will, of course, make for more accurate observations but is not essential to the care of these people. Usually the patient is placed in the room and left for a period of time in the resting position so that his circulation becomes adjusted to that temperature and remains stable. The readings are taken by means of special instruments which, with a small calculation, gives the actual temperature of the extremity at that point. Here we use the dermotherm, designed by the Taylor Instrument Company. The temperature of various areas on the extremities are noted at ten to fifteen minute intervals. This is done repeatedly to be sure that there are no outside influences changing the temperature of the extremity. After a definite temperature level has been determined, the amount of spasm involved can be determined by blocking the nervous impulses to the extremity by various methods, such as general anesthesia, spinal anesthesia, or local nerve blocks (the posterior tibial nerve in the foot, or the ulnar nerve in the arm). These procedures do away with the vasomotor control of the vessels and allow

them to dilate. In this way the amount of occlusion and spasm can be estimated and a good indication will be given of what results might be expected from any proposed surgery of the sympathetic nervous system which controls these impulses. This vasodilatation of the extremity also can be produced by warming the patient's trunk or by immersing his upper extremities in warm water if the lower are being examined.

Oscillometer: This instrument was designed by Pachon. There are two types, the recording and the nonrecording. The principle is essentially an indicator coupled through a diaphragm to an inflated cuff around the extremity. This gives us an accurate record of the quality of the pulsation in the deep vessels in each extremity and at different levels in one extremity. There is a fairly well determined set of normal readings, and readings obviously below these are abnormal. However, even more important is the finding of a marked difference in the readings on the two extremities.

Histamine reaction: This is an indicator of the superficial circulation and often is of assistance in estimating the point at which one can expect a successful amputation. It is done by injecting one-tenth cubic centimeter of histamine intracutaneously at varying levels in each extremity and then comparing the resulting redness or flare around the injections. Where the circulation is good there will be a large resulting flare and the opposite is true where the superficial circulation in the skin is very poor.

X-rays: These are used in two ways. First, an X-ray of the extremity and foot often will show the degree of calcification in the major vessels. However, the extent of calcification shown by X-ray does not necessarily indicate the degree of obstruction in the vessels. Arteriosclerotics, of course, show calcification. Inflammatory occlusive diseases of the extremities, such as thrombo-angiitis obliterans, show no calcification. The second method in which the X-ray is employed is following the injection of an opaque media into the femoral artery—X-rays are taken quickly following this. This opaque media is carried through the circulation into the smaller arteries and arterioles of the extremity. If the major arteries are blocked, this method shows the extent of collateral circulation, because the substance will find its way through these collateral vessels. This method is of value but is not used extensively as it requires considerable technique. In some clinics it is used before treatment is started to help estimate the results that can be expected. If, by this method, the major vessels are shown to be blocked and we find very little collateral circulation, we cannot expect much result from treatment, for all our methods of treatment aim at increasing the collateral circulation.

DISEASES

In discussing the various forms of disease of the peripheral vessels, we must first divide them into two main groups: organic and functional. The first group, of which arteriosclerosis is an example, has definite organic disease involving the vessel wall; and the second group, the best example of which is Raynaud's disease, has no disease of the vessel itself, but the symptoms and findings are the result of a disorder of the regulating mechanism controlling the vessels.

Raynaud's Disease: Raynaud's disease is a functional disorder characterized by the following: (1) Attacks of local syncope and asphyxia involving fingers, hands, toes, feet and more rarely cheeks, nose and lobes of ears; usually being precipitated by exposure to cold but may be emotional in origin. (2) The local characteristic features of pallor, cyanosis, numbness and lowering of surface temperature in the affected parts associated with slight discomfort or real pain. (3) In most cases a symmetrical distribution of the attack which may last from a few minutes to hours. (4) Tendency to become progressive. (5) Presence of arterial pulsations in affected parts except during attacks when they may be feeble or absent. (6)—Preponderance of females. *Etiology:* Is not known. Considerable experimental work would tend to indicate that the lesion is in the smaller digital arteries. Others feel the causative factor to be in the vasomotor system and that the increased susceptibility of the local vessels is a secondary result. These attacks can be produced by emotional factors when the environmental temperature is normal. *Treatment:* (1) Change in climate, social or marital status or occupation may help. (2) Wearing apparel, warm gloves and stockings. (3) Drugs: Not satisfactory; give only temporary relief. (4) Gland extracts: No apparent relief. (5) X-ray: Results not good. (6) Surgery of the sympathetic nervous system gives much more satisfactory results in the lower extremities than in the upper. The poor results obtained

in surgery of the sympathetic nervous system in the upper extremity have been very much discussed but probably are due to the fact that the operation is not as complete as that used on the lower extremity.

Acrocyanosis: This is a poorly understood condition, most common in young women. The extremities present a constant bluish-red appearance and are cold and moist. It is fairly common but not frequently seen by physicians, as the patients have very few symptoms other than the discoloration. The causative theories include local abnormalities in the skin vessels, glandular disturbances and lesions of the nervous system. It is a functional disorder with an exaggeration of the normal response of the surface vessels to cold or psychic stimulation. *Treatment:* In these cases, treatment is adjusted to the findings in an individual case. Some feel that this condition has been the result of excessive exposure of the extremities to cold, especially during that period of time when fashion decreed short skirts. The severity of the symptoms and findings determine the treatment. Most of these cases are worse in the winter and better in the summer. Some of them tend to become progressively worse and, if severe enough, bilateral-lumbar sympathectomy gives relief.

Erythromelalgia: For a long time this has been considered a disease of primary vasodilatation. These patients usually present themselves with bilateral burning pain in the extremities, marked elevation of local temperature with redness and flushing. Condition is aggravated by heat and exercise, and relief is obtained by cold and elevation of the extremities. Recently this diagnosis has been questioned and some feel it is a form of infection, the cause of which is not known. Treatment requires long period of bed rest with massage and diathermy to regulate the flow of blood.

Arteriosclerosis: Under this term we include all forms. It is a disease of elderly people but does, under certain conditions, such as diabetes, occur in young people. We are interested mainly in the diagnosis and treatment; therefore, causes and pathology will be omitted. It is sufficient for our purpose to say that when the disease reaches a certain point thrombosis occurs and the patient presents himself to his physician, probably complaining of fatigue or actual pain on walking. In his history he may describe a similar occurrence some time previously with gradual recovery. This would indicate an occlusion in another vessel at that time, with establishment of sufficient collateral circulation again to permit normal use of the extremity. Unfortunately, these patients frequently are seen for the first time with actual gangrene. In examining these patients, remember that a foot may be entirely pulseless and still have a fairly adequate circulation. This is seen in patients with infection; many of them handle infection well, although there is no pulsation present. This is important, as the treatment must be based on an estimation of the circulation in an extremity. Obviously one does not amputate at the thigh for an infection which the circulation, although damaged, is capable of localizing. Close cooperation between the patient's physician and the surgeon is important as the peripheral vascular manifestations are only part of a general disease. The treatment is directed toward relief of the patient's pain and the establishment of collateral circulation. (1) Rest: Very important; do not elevate as it decreases the circulation. (2) Warmth: Best produced by constant temperature cradle. (3) Exercises. (a) Active postural exercises as described by Buerger, which consists of elevation of the extremity until blanching is produced. This is followed by dependency until rubor is marked. The extremity is then placed in the horizontal position. The cycle usually takes ten minutes and the patient repeats this six times, twice daily. (b) Intermittent suction and pressure. There are various forms of apparatus and different types of technique used. Essentially this consists of a closed, air-tight chamber in which the extremity is placed, and the pressure in the chamber is alternated from a positive of 20 to 40 millimeters of mercury, to a negative of 80 to 100 millimeters of mercury. This cycle varies from two to four times a minute. This form of treatment may be given in varying amounts, depending on the requirement of the patient's circulation. (4) Contrast baths: Hot water, temperature 100 to 110 degrees, cold water, 40 to 60 degrees. The feet are immersed alternately in each bath for one minute. This is repeated fifteen times. (5) Intermittent venous occlusion. This consists of the application to the proximal part of an extremity, of a pneumatic cuff which is inflated to a pressure approximating the diastolic level. This results, of course, in obstruction of the venous return but does not interfere with the

arterial flow. When the pressure is released, hyperemia develops. An apparatus has been designed which permits automatic alternating periods of venous congestion and release. These treatments may be carried on for many hours daily, and in many cases have given marked relief. (6) Vein ligation. This has been used in selected cases of threatened gangrene and is based on experience following trauma which showed a decrease incidence of gangrene where the vein accompanying the severed artery was tied off. (7) Prophylactic care. These patients are instructed regarding bathing of the feet, the care of minor injuries, the wearing of proper stockings and shoes. It is not sufficient merely to instruct these patients. The physician must see them frequently to insure the proper care, and it is well each time the patient is seen to make a few suggestions concerning the general care of his feet. Such things as suggestions about the type of socks, and the condition of his shoes. This is done to impress on the patient the importance of this care. It is well to impress on the patient's mind that you are never quite satisfied he is doing everything he should do.

Thrombo-angiitis Obliterans: This is probably the most important disease of this group, as it occurs in young adults and is incapacitating if not treated. It is an inflammatory lesion involving the arteries and veins. It occurs chiefly in the lower extremities, although the upper extremities may be involved, as well as other organs of the body. *Etiology.* Race: Occurs in all nationalities, but any group of cases shows a preponderance of Jews. Sex: 95 to 98 per cent males. There is no explanation available for this. Age: Mainly in younger adults. *Causes:* (Theories) (1) Infectious toxic theory is based on the conception that the disease is a low grade infection, or the effect of the toxins of such infection. Lesions similar to those found have been reproduced in animals by the implantation of portions of resected, superficial veins. No organism has been found but it may be due to the virus. (2) Tobacco. This is a questionable factor; some believing that the disease has never been demonstrated in nonsmokers. Others have reported cases in patients who have never smoked. Experimentally it has been proven that smoking definitely decreases the surface temperature of the extremities. *Diagnosis:* These patients come because of excessive fatigue, pain of claudication, infections or gangrene. The patient may complain of a tired feeling in one leg after walking or dancing, which is relieved by a very short rest but recurs again with exercise. The site of the pain may be the leg, ankle or arch of the foot. Most of these patients have worn some form of arch support or special shoe. Any pain in the extremities brought on by uninterrupted exercise and relieved by rest must be viewed with suspicion; it is the pain of claudication. This is merely anoxemia of the muscles due to insufficient blood supply. The pain may stop with rest, even though the patient remains standing. Recurring superficial phlebitis in the male is very suggestive of early thrombo-angiitis obliterans. Rubor indicates a moderately advanced case. This is often mistaken for infection of the foot. It disappears on elevation and there is no heat associated with it. Pulsations: Absent or diminished. X-ray: No calcification of vessels. Spasm: Advanced cases show no response, but early cases have considerable associated spasm probably due to irritative inflammatory lesion of the vessel and to the fact that they have been seen before sufficient damage has been done to prevent response to the nervous impulse. The disease usually manifests itself in one extremity but eventually is bilateral. The differentiation between this and arteriosclerosis is largely academic, as the treatment is nearly the same. The age, x-ray, unilateral involvement, and the general involvement in the arteriosclerotic patient help. There are several group classifications made of the cases as to the extent of lesions, etc., but they resolve mainly into two groups: (1) Those in which enough collateral circulation is present to prevent trophic changes or limit the extent of gangrene. (2) The rapidly progressive group in which collateral circulation does not keep pace with the occlusion of the vessels.

Treatment: (1) Extensive gangrene with or without rest pain. Amputation; the point of amputation must be decided for each individual case depending on the severity of involvement and the condition of the collateral circulation. (2) Mild trophic changes with severe rest pain. The treatment is conservative where possible, lumbar ganglionectomy may help these cases; if pain is severe, section of the sensory nerves of the leg may be necessary for relief. If none of the procedures are successful, amputation will be necessary. (3) The remainder are milder types

which are treated conservatively. The treatment requires rest in bed for one to two months, active postural exercises, or alternate suction and pressure therapy, contrast baths, or radiant heat. Nonspecific protein injection; typhoid vaccine is given in doses of 20 to 200,000,000 intravenously every four to five days for six injections. This may be repeated after four to six weeks. Fever therapy: Raising the body temperature by mechanical means carries with it an improvement in the peripheral circulation, similar to that accomplished by foreign protein injection, not without danger—local applications. Tobacco must be stopped. Remove all foci of infection. At the onset the patient must be made to understand the exact condition and the possible penalties he will pay if he does not cooperate. Frequently they must give up entirely the type of work they are doing and secure employment of a different nature. It is obviously wrong to allow a patient with extensively impaired circulation to be employed where he is required to be on his feet all day; or where he may injure his foot by any falling objects; or where he is exposed to continuous cold. Surgery of the sympathetic nervous system: Probably in selected cases resection of the second, third and fourth lumbar ganglia offers considerable help. It will not cure the disease but merely insures maximum circulation possible to the extremity under the diseased condition of the vessels.

Embolism: When obstruction of a vessel occurs as a result of a piece of tissue breaking off from a lesion in the heart and being carried to the peripheral circulation to a point where the caliber of the vessel no longer permits its further passage, we have what is known as embolism of that artery. The most common sites are the axillary and brachial arteries in the upper extremity; the aorta, common iliac, femoral and popliteal, in the lower extremity. The onset is sudden with excruciating pain, accompanied by blanching of the skin and paralysis of the extremity. The pain is extremely severe and often not relieved by large quantities of morphine. The pain is not considered to be due to the actual embolus in the extremity but to the severe spasm of all the vessels in that extremity which result from the obstruction, and some form of vasodilator, such as papaverine hydrochloride, will give more relief than morphine. The treatment depends on the time interval between the onset and the time seen by the physician. If seen within eight to ten hours, the treatment should be surgical removal of the embolus if possible. The results of successful embolectomy are very dramatic. The color of the extremity returns to normal and the patient immediately is free of all pain. If seen late, the treatment is the same as that used in thrombosis of an artery; namely, rest, heat, vasodilators, and alternate suction and pressure. The differential diagnosis between embolism and thrombosis is, at times, very difficult. However, embolism always occurs in an individual with an organic heart lesion, such as mitral or aortic valve lesions, endocarditis, or an individual who has had a coronary occlusion. The mortality in this group is high, due of course to the fact that the primary cause lies in a bad heart.

Thrombo-phlebitis: As the name implies, this is a thrombus in a vein with inflammation. It can occur either in the deep veins or superficial veins. It occurs with many forms of illness, such as pneumonia and typhoid, following surgical procedures, following trauma and following childbirth. The onset is usually with pain, elevation of temperature, swelling of the extremity and bluish discoloration. The onset of an extensive thrombo-phlebitis involving the veins in the lower abdomen can, in the early stages, closely resemble an embolus. I have twice seen patients in consultation on whom a diagnosis of embolus had been made. Both of these patients had thrombo-phlebitis. Now the importance of recognizing this condition, of course, lies in the fact that all the treatment applicable to obstructive disease of the arteries is contraindicated in thrombo-phlebitis. These patients are put to bed, the extremity is elevated with dry heat over it, fluids are limited, and no active treatment instituted.

In summarizing, it should be pointed out that while the knowledge of vascular diseases of the extremities has increased greatly in the past few years, there still are no specific forms of treatment for these conditions, and the best results are obtained only through the cooperation of the physician, the surgeon, and the physical therapist.

The Relation of Posture to Physiology

Lyman A. Cavanaugh, M. D.,* and Phillip Ross Sutherland, M. D.**

During the past ten years, the authors have had occasion to investigate carefully some sixty odd children of various ages and various types of postural deformities. This work has been done under the auspices of the Adelaide Tichenor Orthopedic Clinic of Long Beach, California. It has become more and more apparent during this time that these children commonly have some underlying metabolic disturbance which we feel may be a primary factor in the posture defects.

It is logical to assume that if an individual is given a normal, well developed skeletal structure, normally developed muscular system and good muscle tone, posture problems will be almost impossible. With this in mind, during the past two years, the authors have checked carefully in the following manner each patient who came into our clinic with posture problems:

Careful basal metabolisms were done in each individual. Roentgen studies to reveal the degree of osseous development of other areas routinely were made in each individual. Complete blood counts, urine analysis, Kahn precipitation and blood cholesterol were checked. In most instances sugar tolerance and serum calcium and phosphorus studies were carried out. The purpose of this paper is to point out the high incidence of metabolic disturbances present in this group of children who were studied. The authors also hope that sufficient interest will be stimulated that other groups treating this type of physical disturbance will evaluate more carefully the general physiological processes in these individuals. Posture training and exercise certainly are an important part in the correction of defective posture. An adequate dietary regime, insofar as proteins, mineral salts and vitamins, are essential to the development of a good skeletal and muscular structure. However, it has been our experience that these alone do not always suffice. The lack of that intangible and yet highly important sense which we might call "feeling of well-being" will defeat all the physical therapy and ideal dietary regimes one might prescribe.

The statistical data is to be presented in a more complete analytical form at a later date. For the purposes of this paper, the following is of significance:

There was an incidence of goitre on the maternal side of the families from which these patients came, of 38.2 per cent. Such clinical annities as enuresis, retarded dentition, backwardness in school, orthodontial defects, abnormal behavior tendencies, and chronic muscle aching, or so-called "growing pains" in from 23 to 47 per cent of the cases studied. Basal metabolisms were 16 per cent or more below average, normal in 87.5 per cent of the 34 cases studied. Blood cholesterol levels of 200 mgms. per cent were found. In 64 per cent a retardation in ossification of growth centers of two years or more was present in 73.5 per cent.

When dependent on clinical obervations, no statistical analysis is fool-proof. However, in spite of the many variables, the high incidence of poor skeletal development is low. Basal metabolic rates and increase in blood cholesterol could not occur accidentally. We do not attempt to analyze these statistics as to probable error. We feel that they are sufficiently obvious to create more attention to the investigation of metabolic processes in these individuals without careful mathematical analysis.

We do not feel that maternal goitre or maternal thyroid deficiency is responsible for all postural disturbances. Nor do we feel that a retarded skeletal development is responsible for all such defects. It is our sincere belief, however, that metabolic disturbances which may dictate to the individual a poor skeletal development or poor muscle structure and muscle tone will be an important factor in a considerable percentage of such cases. It is our sincere hope that other individuals, dealing with these problems, will more carefully go into the bi-chemical processes in such individuals.

Results of treatment in these individuals is

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again purely based on clinical observation which at best is an indefinite basis for conclusions. However, the authors feel that the correction of these underlying physical disturbances not only offer a much better prognosis or permanent improvement in posture, but also give the individual a much better chance,—a much greater chance to build a good structure from the standpoint of both bone and muscle.

Schools for Physical Therapy Technicians

The survey of schools for physical therapy technicians was assigned to the Council on Medical Education and Hospitals in 1934. Following the initial inspection and study of thirty-five schools the "Essentials" were formulated and adopted by the Council and passed by the House of Delegates of the American Medical Association on May 9, 1936. The first list of approved schools appeared in THE JOURNAL Aug. 29, 1936, and several lists have been published since.

At the November 1937 meeting of the Council, certain changes were made in the "Essentials" for the purpose of clarification of meaning but which did not alter the original considerations in the requirements. The Council on Physical Therapy of the American Medical Association, the American Congress of Physical Therapy and the American Physiotherapy Association lent their full cooperation in the preparation of the original standards and continue to aid the Council in the consideration of new schools and in problems dealing with the "Essentials."

No standards for graduate courses for technicians have as yet been promulgated. The Mayo Clinic now offers organized graduate courses for technicians.

The "Essentials of an Acceptable School for Physical Therapy Technicians" aim to provide more adequate facilities for the training of technicians. The investigations of the various courses during the past few years have revealed in many cases a deplorable lack of requirements, organization, qualified faculty and particularly clinical material with which students can develop skill in the application of this knowledge. These conditions exist principally in so-called commercial schools. Approval is withheld by the Council for courses where arrangements are such that students are enrolled without the necessary preliminary background and proceed across a well paved short cut in their efforts to enter this highly technical field.

Advertising commercial schools which adhere to no particular standards are turning out each year large numbers of inadequately prepared technicians. Nevertheless recent attention has been drawn to the fact that there is an acute shortage of graduates of approved schools.

The American Registry of Physical Therapy Technicians sponsored by the American Congress of Physical Therapy has now become recognized as a reliable means of identifying those qualified. The Board of Registry accepts for examination graduates of schools approved by the Council on Medical Education and Hospitals. Information concerning registration may be secured from Miss Marion G. Smith, registrar of the American Registry of Physical Therapy Technicians, 30 North Michigan Avenue, Chicago.

It is the desire of the Council on Medical Education and Hospitals to cooperate in every way with any hospital or educational institution in an effort to develop more well organized and well administered courses for technicians in the United States.

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Schools Approved for Training Physical Therapy Technicians

By the Council on Medical Education and Hospitals

Name and Location of School	Direction	Entrance Requirement	Duration of Course	Time of Admission	No. of Stud. Adm. Annu.	Tuition	Certificate, Diploma, Degree
California Hospital, Los Angeles[1]	G. P. Jennings, M.D.	(a) R.N. (b) Grad. phys. ed.	18 mos.	Jan. & July	6	$200	Certificate
Children's Hospital, Los Angeles[2]	J. C. Wilson, M.D.	(a) R.N. (b) Grad. phys. ed.	15 mos.	Sept.	12	$150	Diploma
Stanford University Hospital, San Francisco	W. H. Northway, M.D.	(a) R.N. (b) Grad. phys. ed.	12 mos.	Apr. & Oct.	12	$215	Certificate
Walter Reed General Hospital, Washington, D. C.[3]	A. A. de Lorimier, Capt., M.C.	Grad. phys. ed.	12 mos.	Sept.	10	None	Certificate
Northwestern University Medical School, Chicago[4]	J. S. Coulter, M.D.	(a) R.N. (b) Grad. phys. ed. (c) 3 yrs. coll.	9 mos.	Oct.	16	$300	Certificate
Bouvé-Boston School of Physical Education, Boston[5]	Howard Moore, M.D.	High sch. grad.	3 and 4 yrs.[a]	Sept.	10	$400 yr.	Diploma or B.S.
Harvard Medical School, Course 445, Boston[6]	F. R. Ober, M.D.	(a) R.N. (b) Grad. phys. ed. (c) Coll. grad.	9 mos.	Jan. & Sept.	18	$150	Certificate
Boston University, Sargent College of Physical Education, Cambridge, Mass.[7]	Prof. E. Hermann, Dean	High sch. grad.	4 yrs.	Oct.	12	$350 yr.	B.S.
Posse School, Kendal Green, Mass.[8]	W. F. Carlson, President	High sch. grad.	3 and 4 yrs.[b]	Sept.	9	$400 yr.	Diploma or B.S.
Mayo Clinic, Rochester, Minn.[9]	F. H. Krusen, M.D.	(a) R.N. (b) Grad. phys. ed. (c) 2 yrs. coll.	12 mos.	Oct.	15	None	Certificate
St. Louis University School of Nursing, St. Louis[10]	A. J. Kotkis, M.D.	High sch. grad.	4 yrs.	Sept.	2	Univ. fees	B.S.
University of Buffalo, Buffalo[11]	G. G. Martin, M.D.	R.N.	18 mos.	.....	8	Univ. fees	B.S.
New York Society for the Relief of the Ruptured and Crippled, New York City[12]	K. G. Hansson, M.D.	(a) R.N. (b) Grad. phys. ed.	9 mos.	Sept.	20	$300	Diploma
D. T. Watson School of Physiotherapy (affiliated with University of Pittsburgh School of Medicine), Leetsdale, Pa.[13]	Jessie Wright, M.D.	(a) Grad. phys. ed. (b) 2 yrs. premed.	22 mos.	Sept.	8	None	Diploma or B.S.
College of William and Mary, Richmond, Va.[14]	H. H. Hibbs, Jr., Ph.D., Dean	(a) R.N. (b) Grad. phys. ed. (c) 3 yrs. coll.	9 and 12 mos.[c]	Sept.	10	Coll. fees	Certificate
University of Wisconsin, Madison[15]	E. A. Pohle, M.D.	(a) R.N. (b) Grad. phys. ed.	9-12 mos.	[d]	20	Univ. fees	Certificate

AFFILIATED CLINICAL FACILITIES

1. Glendale Sanitarium and Hospital, Glendale, and Los Angeles County Hospital and Orthopaedic Hospital, Los Angeles.
2. Cedars of Lebanon Hospital, Los Angeles County Hospital, and Presbyterian Hospital—Olmsted Memorial, Los Angeles . . . and others.
3. Langdon School for Crippled Children, Washington, D. C.
4. Michael Reese Hospital, Passavant Memorial Hospital, and St. Luke's Hospital, Chicago . . . and others.
5. Boston City Hospital, Children's Hospital, Massachusetts General Hospital, and Robert Breck Brigham Hospital, Boston . . . and others.
6. Children's Hospital, Harvard Infantile Paralysis Commission Clinic, Industrial School for Crippled and Deformed Children, and Massachusetts General Hospital, Boston . . . and others.
7. Massachusetts General Hospital, Massachusetts Memorial Hospitals, and Perkins Institute for the Blind, Boston, and Cambridge Hospital, Cambridge . . . and others.
8. Ring Sanatorium and Hospital, Arlington Heights, and Beth-Israel Hospital and Industrial School for Crippled and Deformed Children, Boston . . . and others.
9. Colonial Hospital, Kahler Hospital, St. Mary's Hospital, and Worrall Hospital, Rochester.
10. Firmin Desloge Hospital, St. Louis.
11. Buffalo City Hospital, Buffalo.
12. French Hospital, and New York Hospital, New York City.
13. Allegheny General Hospital, Children's Hospital, Falk Clinic, and St. Francis Hospital, Pittsburgh . . . and others.
14. University of Virginia Hospital, Charlottesville, and Crippled Children's Hospital, Stuart Circle Hospital, and Wheeldon Clinic, Richmond . . . and others.
15. State of Wisconsin General Hospital, and Wisconsin Orthopedic Hospital for Children, Madison.

NOTES

a. Four year course leads to B.S. degree from Simmons College.

b. Four year course leads to B.S. degree from State Teachers College, Hyannis.

c. Twelve months' course for those with three years of college.

d. Preferably in summer semester.

The Physiotherapy Review

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Business Manager: HAZEL PUTMAN

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GERTRUDE BEARD

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As Theodore Roosevelt once said, "Every man owes it to himself to give some time to his chosen profession," so it is fitting for us at this time to stop and consider the significance of these words as the Eighteenth Annual Convention of the American Physiotherapy Association draws near.

Our hosts, the members of the Denver Chapter, have given their best efforts to make this convention outstanding. We as members can show our interest in our profession by attending the convention, taking part in the discussions and deliberations, renewing old acquaintanceships and building new ones. In these days of rapid changes in methods and technique it is most beneficial, in fact necessary, that an exchange of ideas takes place. You owe it not only to yourself but to the most advantageous practice of your profession to bend every effort to attend your National Convention, for only in a meeting of this kind is possible the interchange of ideas mentioned above.

The Denver Chapter has planned a most interesting meeting from the standpoint of social functions in addition to professional interest to make your stay there enjoyable. Trips to points of scenic beauty have been organized and social functions have been arranged in order to fill every moment with pleasurable and profitable enjoyment. To crown their efforts with success it is now necessary only for us to assure our hostess chapter of a good attendance. Let each of us do his best to make it the most successful convention in American Physiotherapy Association history.

NATIONAL EXECUTIVE COMMITTEE

Program of Eighteenth Annual Convention, June 25 to 30, 1939

Sunday, June 25

4:00 P. M.—**Registration.**
6:00 P. M.—**Buffet Supper**—Informal reports by chapter representatives.
Professional entertainment.

Monday, June 26

9:30 A. M.—**Address of Welcome**—Robert Packard, M. D., Orthopedic Department, Children's Hospital, Denver, Colorado.
Business Meeting
2:00 P. M.—**"Diathermy in Pelvic Disorders and in Phlebitis"**—John R. Evans, M. D., Obstetrician and Gynecologist, St. Luke's Hospital, Denver, Colorado.
3:00 P. M.—**"The Role of Physiotherapy in the New Social Security Program"**—R. C. Hood, M. D., Washington, D. C.
8:15 P. M.—**"Physiotherapy in Psychiatry"** — Clarke H. Barnacle, M. D., Associate Hospital Neurologist, Univ. Colo. School of Medicine, Denver.

Tuesday, June 27

9:30 A. M.—**"Cerebral Palsy—General Considerations"**—M. E. Pusitz, M. D., Orthopedist, Topeka, Kansas.
10:45 A. M.—**"Physiotherapeutic Regime in Cerebral Palsy"**—M. E. Pusitz, M. D., Orthopedist, Topeka, Kansas.
12:30 P. M.—**Officer's Luncheon** — Mrs. Eloise Landis, Secretary, Presiding.
2:30 P. M.—**Trip** to Troutdale-in-the-Pines (Barbecue supper).

Wednesday, June 28

9:30 A. M.—**Business Meeting.**
2:00 P. M.—**Orthopedic Paper**—Foster Matchett, M. D., Associate Hospital Orthopedic Surgeon, Univ. Colo. School of Medicine, Denver; Children's Hospital.
3:00 P. M.—**'Some Common Traumatic Conditions of the Extremities"**—Hamilton I. Barnard, M. D., Chief of Division of Orthopedics, Univ. Colo. School of Medicine, Denver; Children's Hospital.
7:30 P. M.—**Banquet** (Formal).
Toastmaster—John W. Amesse, M. D., President of Colo. State Medical Society, Associate Prof. of Pediatrics, Univ. Colo. School of Medicine, Denver.
Speaker—S. Arthur Henry, President Elect, Denver Bar Association.

Thursday, June 29

9:00 A. M.—Round Table Discussion—**"Education"** Miss Constance Greene—Chairman.
O. N. Anderson, M. D., Council on Medical Education and Hospitals of the American Medical Association.

Miss Florence Phenix—Committee on Education of A. P. A.

10:45 A. M.—Round Table Discussion—**"Massage"**
Miss Hazel Furscott—Chairman.
Miss Gertrude Beard—Northwestern Univ., Chicago.
Miss Mildred Elson—Editor of THE PHYSIOTHERAPY REVIEW, Chicago, Ill.
Miss Doris Anderson, Chief Aide, Fitzsimmons Hospital, Denver, Colo.
Miss Evelyn Anderson, Stanford Hospital, San Francisco.

2:30 P. M.—**"Scoliosis"**—Joseph C. Risser, M. D., Orthopedic Surgeon, Los Angeles.

3:30 P. M.—**"The Bilateral Asymetry of the Skeletal Framework of the Human Body"**—Lulu E. Sweigard, M. D., New York Univ., New York.

8:00 P. M.—**Elitch's Gardens**—Dramatic Production.

Friday, June 30

9.30 A. M.—Round Table Discussion—**"Feet"**—
Miss Catherine Worthingham—Chairman.
Joseph C. Risser, M. D., Los Angeles, Calif.
Miss Mildred Elson, Editor of THE PHYSIOTHERAPY REVIEW, Chicago, Ill.
Miss Susan Roen, Director of the Physical Therapy Department, Orthopedic Hospital, Los Angeles, Calif.

2:30 P. M.—**Children's Hospital Clinic**—Conducted by Atha Thomas, M. D., Asst. Prof. of Surgery (Orthopedic) Univ. Colo. School of Medicine.
Miss Catherine Bennett, director of Physical Therapy, Children's Hospital, Denver

4:00 P. M.—**Informal Tea**—Children's Hospital—Host.

Glossary*

Due to the confusion of abbreviations and terms concerning the various allied organizations and committees which frequently are brought into the discussions at our convention meetings, the Executive Committee requested that the following explanation be prepared for your information:

American Congress of Physical Therapy (Congress)

Membership: A national organization composed of members of the American Medical Association and teachers of physical therapy in recognized medical schools.

Purpose and Activities: Scientifically to exploit this discipline for the benefit of the medical and its allied professions, and to expose fallacies and quackery practiced in the name of physical therapy. It annually meets as a collective body or in sectional groups to discuss the latest progress and most important developments in its field. The Congress also sponsors the activities of the American Registry of Physical Therapy Technicians.

Publication: Archives of Physical Therapy, X-Ray and Radium, monthly.

American Hospital Association.

Membership: Approximately 2,175 individual members and 2,350 institutional members.

Purpose and Activities: To promote the welfare of the people through the development of hospital and out-patient service. To further this purpose, the Association encourages professional education and scientific research, aids in the health education of the public, cooperates with other organizations having a similar object, and does all things which may best promote hospital and out-patient service efficiency. The Association also accredits hospitals and, through the Hospital Library and Service Bureau, makes available to hospitals and individuals literature pertaining to medicine, nursing and related subjects.

Publications: Hospitals, monthly; Transactions of the American Hospital Association, annually.

American Registry of Physical Therapy Technicians (Registry).

Sponsored by the American Congress of Physical Therapy.

Membership: Graduates of schools approved by the Council on Medical Education and Hospitals of the American Medical Association.

Purpose and Activities: To maintain the minimum standards of educational and technical qualifications as given by the Council on Medical Education and Hospitals of the American Medical Association for technicians administering physical therapy in hospitals, clinics and physicians' offices. To cooperate with the Council on Medical Education and Hospitals of the American Medical Association in its investigation, classification and periodic inspection of schools which conduct training courses for physical therapy technicians. To conduct a placement bureau for registered physical therapy technicians, and to promote the use of these technicians in hospitals and physicians' offices.

Information concerning registration may be secured through Miss Marion G. Smith, Registrar of the American Registry of Physical Therapy Technicians, 30 North Michigan Avenue, Chicago, Illinois.

Council on Medical Education and Hospitals.

Membership: A department of the American Medical Association.

Purpose and Activities: Created for the express purpose of improving medical education in this country. The Council's functions include the maintenance of standards and the

*This information is given as obtained from above committees and associations.

publication of approved lists of medical schools. Its supervision of hospitals includes registration, approval for intern training, and approval for residences in specialties. These lists are widely used and unhesitatingly accepted by licensing bodies, medical schools, hospitals, governmental departments and other agencies too numerous to mention.

The Council has adopted standards for and publishes lists of schools for medical technicians including occupational therapy, clinical laboratory and physical therapy. More recently the Council has responded to the demand for authentic information regarding the qualifications of those physicians who specialize in certain branches of medicine. Through its supervision of the various special examining boards it offers to the public a means of identifying those who have had a satisfactory training in a specialty.

Publications: Reports in the Journal of the American Medical Association.

Council on Physical Therapy (Council)

Membership: Composed of twelve men including one internist, two physiologists, one pathologist, one physicist, one radiologist, one dermatologist, two orthopedic surgeons, one general surgeon and two physical therapists.

Purpose and Activities: To gather and disseminate such information as will assist the medical profession in determining the therapeutic value of certain devices and methods employed in the administration of physical therapy, and to protect both the public and the conscientious manufacturer against fraud and misrepresentation.

Publications: Handbook of Physical Therapy, and reports in the Journal of the American Medical Association.

National Organization for Public Health Nursing (NOPHN)

Membership: Individuals, approximately 10,000; 19 state organizations; and 354 agencies.

Purpose and Activities: To promote and make more effective all types of public health nursing services throughout the country through the development of standards in policies, practices, and qualifications, through contact with public health nursing on a local, state and national basis, and through cooperative relationships with other national health and social agencies. Activities include advisory and consultation service, approving university courses in public health nursing, field studies and special statistical studies.

Publications: Public Health Nursing, monthly; Listening In, quarterly.

Chicago Chapter

Mrs. Myrtle Reeb and Marie Czwalinski are leaving for Arizona to work on the Arizona State Program for Crippled Children.

District of Columbia Chapter

The District of Columbia Chapter held an unusually interesting meeting on April 12. Dr. G. W. Leadbetter opened the meeting with an informal talk reviewing the history of the use of physical therapy since the War. Following this Dr. Richard Kovacs of New York spoke on "Physical Therapy in Traumatic Conditions." The meeting was held at the Emergency Hospital. Mrs. Katherine Moncure, physical therapist at the hospital, was hostess and refreshments were served by the dietician. A number of physicians were present, and about one hundred physical therapy technicians, nurses and students. Four physical therapy technicians, including Miss Johnson, their head, came from Johns Hopkins in Baltimore.

New Jersey Chapter

The New Jersey Chapter recently joined the New Jersey Hospital Association.

New York Chapter

Miss Grace McNee, physical therapist in Muhlenberg Hospital, Plainfield, New Jersey, will be married in May to F. Paul Heltman of Kent, Ohio.

Ohio Chapter

The Ohio Chapter held its Fourth Annual Meeting at the New Hotel Secor, Toledo, May 3rd and 4th, with a program as follows:

Wednesday, May 3

9:00 A. M.—Registration.

10:00 A. M.—Word of Welcome—Betty M. Masola, Chairman on Local Arrangements.

Address by President—Charlotte James Eastman.

Business meeting.

Lois B. Young, Presiding

11:00 A. M.—"The Importance of Physical Therapy in the Treatment of Fractures."—Dudley M. Stewart B.S., M.D., Department of Orthopedic Surgery, Toledo Clinic, Toledo.

Showing of Films—"Massage"—"Effect of Massage on the Circulation of the Blood."

Charlotte James Eastman, Presiding

2:00 P. M.—"Arthritis and Its Treatment," Walter J. Zeiter, M.D., Director of the Department of Physical Therapy, Cleveland Clinic, Cleveland.

3:00 P. M.—"Cerebral Palsy, A Discussion on the Etiology and the Principles of Surgical Treatment," Clarence H. Heyman, M.D., Senior Instructor of Orthopedic Surgery, Western Reserve University; Orthopedic Surgeon Gates Hospital for Crippled Children, Elyria.

6:30 P. M.—Dinner.

Toastmaster—Mrs. M. V. Thomas.

Address.

8:00 P. M.—Ohio State Medical Association—Evening Session.

Thursday, May 4

9:00 A. M.—Business Meeting. Election of Officers.

Martha Kearney, Presiding

11:00 A. M.—"Physiotherapy Treatments for Cerebral Palsies," Miss Edna M. Blumenthal, Physiotherapist, Randall J. Condon School, Cincinnati.

12:00 Noon—Luncheon—Museum of Art.

2:00 P. M.—Convalescent Home, Toledo Society for Crippled Children.

"Case Presentation," Burt G. Chollett, M.D., Chief of Staff Convalescent Home, Orthopedic Surgeon, St. Vincent Hospital, Toledo; Albert L. Bershon, M.D., Orthopedic Surgeon, St. Vincent Hospital, Toledo.

Tea and Social Hour.

8:00 P. M.—Ohio State Medical Association Banquet.

Rhode Island Chapter

The Rhode Island Chapter, although small in membership, held three very interesting meetings this year.

October—Annual business meeting, with election of officers.

January—Lecture: "Perthes' Disease of the Hip" (illustrated with slides) by Dr. Murray S. Danforth, Orthopedic Surgeon of Providence, R. I.

April—Lecture: "Reading of X-Ray Plates" by Dr. James F. Boyd, Chief of the X-Ray Department, Rhode Island Hospital. Films, dealing with bone disease and abnormalities, were shown. This meeting was so successful that Dr. Boyd is to speak at a special meeting in May on "X-Ray of Fractures Only."

Tri-State Hospital Assembly

The Chicago and Wisconsin Chapters participated in the Tri-State (Illinois, Indiana and Wisconsin) Hospital Assembly, May 3, 4 and 5, at the Stevens Hotel, Chicago, Illinois. The following Sectional programs were presented:

Wednesday, May 3

2:00-4:30 P. M.

Goldie F. Grear, Milwaukee; Department of Physical Therapy, Milwaukee Hospital, presiding.

"Greetings from the Tri-State Hospital Assembly"—Joseph G. Norby, Milwaukee; Superintendent, Columbia Hospital.

"The Hospital Superintendent's Interest in Physical Therapy"—C. J. Hassenauer, Chicago; Superintendent, Garfield Park Community Hospital.

"Planning a Physical Therapy Department"—William H. Walsh, M.D., Chicago; Consultant, Hospital Planning and Organization.

"Equipping a Physical Therapy Department"—Howard A. Carter, Chicago; Secretary, Council on Physical Therapy, American Medical Association.

"Education for Physical Therapy Technicians"—Gertrude Beard, Chicago; Instructor in Physical Therapy, Northwestern University Medical School.

"General Discussion"—John S. Coulter, M.D., Chicago; Associate Professor of Physical Therapy, Northwestern University Medical School.

4:30-5:00 P. M.

Business session.

7:30-10:00 P. M.

Departmental Panel Round Table Conference—Physical Therapy Problems.

Thursday, May 4

2:00-4:30 P. M.

Joe Hannah Gray, Evanston; Department of Physical Therapy, Evanston Hospital, presiding.

"Types of Cases Treated in a Physical Therapy Department"—Walter P. Blount, M.D., Milwaukee; Clinical Instructor in Orthopedics, Marquette University School of Medicine.

"Procedures in a Physical Therapy Department"—Marien Swezey, Gary; Physical Therapist, Carnegie-Illinois Steel Company Hospital, and Margaret C. Winters, Chicago; Physical Therapist, University of Chicago Clinics; Instructor in Physical Therapy, University of Chicago.

"Financing a Physical Therapy Department"—E. T. Thompson, M.D., Madison; Superintendent, Mt. Sinai Hospital; Executive Secretary, Wisconsin Hospital Association.

"General Discussion"—Robin C. Buerki, M.D., Madison; Superintendent, Wisconsin General Hospital; Director of Study, Commission on Graduate Education; Chairman, Tri-State Hospital Assembly.

Friday, May 5

2:00-4:30 P. M.

Goldie F. Grear, Milwaukee; Department of Physical Therapy, Milwaukee Hospital, presiding.

"Physical Therapy Department in a General Hospital"—John S. Coulter, M.D., Chicago; Associate Professor of Physical Therapy, Northwestern University Medical School.

Demonstration of a Model Physical Therapy Department.

General Discussion.

Index to Current Literature

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Manipulation in Rheumatic Disorders. J. Chart. Soc. M. and M. Gym., April 1939.

The Effect of Induced Hyperpyrexia on the Urea Clearance of Rheumatic Patients. LEE E. FARR, M.D., and JOHANNES K. MOEN, M.D. Amer. J. Med. Sci., Jan. 1939.

Acetyl Beta Methylcholine Chloride by Iontophoresis in the Treatment of Arthritis and Certain Peripheral Vascular Disturbances of the Extremities. O. B. KIEL, M.D. Texas State J. Med., Dec. 1938.

Iontophoresis in Arthritis and Vascular Diseases. Texas State J. Med., Dec. 1938.

ASTHMA

Inhalation Therapy of Bronchial Asthma. JAMES B. GRAESER, M.D. J. A. M. A., April 1, 1939.

Bronchial Asthma: Its Diagnosis and Treatment. ALBERT H. ROWE, M.D. J. A. M. A., Nov. 12, 1938.

Short-Wave Therapy in the Treatment of Asthma. J. P. STOCK, M. D. Brit. J. Phys. Med., Feb. 1939.

BONE AND JOINT DISEASE AND INJURIES

Coccidioidal Osteomyelitis. PAUL E. MCMASTER, M.D., and CHARLES GILFILLAN, M.D. J. A. M. A., April 1, 1939.

Paget's Disease of Bone, or Osteitis Deformans. R. W. AGNEW. J. Chart. Soc. M. and M. Gym., April 1939.

The Use of Skeletal Traction as a Preliminary Procedure in the Treatment of Early Congenital Dislocation of the Hip. C. H. GREGO, JR., M.D. J. Bone and J. Surg., April 1939.

Common Injuries Involving the Knee Joint. LOUIS H. EDMUNDS, M.D. Northwest Med., March 1939.

Physiotherapy and Orthopedics, Part III. W. SAYLE CREER, M.Ch. Brit. J. Phys. Med., Feb. 1939.

Physiotherapy and Orthopedics, Part IV. W. SAYLE CREER, M.Ch. Brit. J. Phys. Med., Mar. 1939.

The Alternation of Blood Supply as a Cause for Normal Calcification of Bone. HARRY C. BLAIR, M.D. Surg., Gynec. and Obst., Oct. 1938.

Sacro-Iliac Strain. A. LAWRENCE ABEL, M. S. Brit. Med. J., Apr. 1, 1939.

The Compensation-Derotation Treatment of Scoliosis. A STEINDLER, M. D. J. Bone and J. Surg., Jan. 1939.

DERMATOLOGY

Treatment of Some Common Diseases of the Skin. HOWARD FOX, M.D. J. Mich. State Med. Soc., Jan. 1939.

Pityriasis Rosae. GEORGE H. CURTIS, M.D. Cleveland Clinic Quarterly, Jan. 1939.

Vascular Obliteration for Various Types of Keratitis. TRYGVE GUNDERSEN, M.D. Arch. Ophthal., Jan. 1939.

Industrial Dermatitis and Melanosis Due to Photosensitization. HARRY R. FOERSTER, M.D., and LOUIS SCHWARTZ, M.D. Arch. Derm. and Syphil., Jan. 1939.

X-Ray and Ultraviolet Light in the Treatment of Dermatophytosis. ONIS GEORGE HAZEL, M.D., and CARL BRUNDAGE, M.D. Southern Med. J., Dec. 1938.

Chronic Polymorphous Light Dermatitis, with a Report of a Case. WM. J. TURNER, M. D. Med. Bulletin Veterans' Adminis., Jan. 1939.

ELECTROTHERAPY

Good and Bad Results in the Treatment of Chronic Cervicitis. WILLIAM T. BLACK, M.D. J. A. M. A., Jan. 21, 1939.

Electrolysis for Superfluous Hair. Current Comment. J. A. M. A., Jan. 21, 1939.

Intrapleural Pneumonolysis by the Closed Method. RALPH C. MATSON. Amer. Rev. Tuber., Feb. 1939.

The Action of Alternating Currents Upon the Electrical Excitability of Nerve. J. REBOUL and A. ROSENBLUETH. Amer. J. Physiol., Feb. 1939.

Electrocoagulation of Tonsils. MEYER L. NIEDELMAN, M.D. Annals of Otol., Rhinol. and Laryng., March 1939.

Acetyl Beta Methylcholine Chloride by Iontophoresis in the Treatment of Arthritis and Certain Peripheral Vascular Disturbances of the Extremities. O. B. KIEL, M.D. Texas State J. Med., Dec. 1938.

Ingrown Toe-Nail: Operation by Electrosurgery. SIDNEY VERNON, M.D. Amer. J. Surg., Nov. 1938.

Salivary Influence on Galvanism. Current Comment. J. A. M. A., Dec. 17, 1938.

The Galvanic Reaction in Guinea Pigs. A. R. BUCHANAN, M. D., and LAURA D. LADD, B. A. Arch. Otolaryng., Jan. 1939.

The Blocking and Deblocking Effects of Alternating Currents on Nerve. A. ROSENBLUETH and J. REBOUL. Amer. J. Physiol., Feb. 1, 1939.

Electric Stimulation and the Excitatory Process in the Nerve Fiber. ICHIJI TASAKI. Amer. J. Physiol., Feb. 1, 1939.

Treatment of Pelvic Inflammation by the Iontophoresis of a Choline Compound. ADOLPH JACOBY, M. D. Amer. J. Obst. and Gynec., Feb. 1939.

EXERCISE

Value of Exercise in Control of Posture. HELEN DOBSON DENNISTON, M.D. Arch. P. T., April 1939.

Sedimentation Speed and Physical Exertion. Abst. in J. A. M. A., Jan. 14, 1939, from Klinische Wochenschrift, Berlin, Nov. 12, 1938.

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Synostosis Operation for Persistent Non-Union of the Tibia. A Case Report. HENRY MILCH, M. D. J. Bone and J. Surg., April 1939.

Fracture of the Neck of the Femur. MARTIN B. TINKER, M. D., and MARTIN B. TINKER, JR., M. D., with the collaboration of A. T. KERR, M. D., and PROF. W. M. SAWDON. J. A. M. A., Mar. 4, 1939.

Fracture of the Elbow and Volkmann's Ischemic Contracture. HENRY W. MEYERDING, M.D. Minnesota Med., Feb. 1939.

Fractures of the Lower End of the Humerus. GEORGE J. GARCEAU, M.D. J. A. M. A., Feb. 18, 1939.

Problems in the First-Aid Treatment of Fractures. EDWARD C. HOLMBLAD, M.D. Pub. Health Nurs., Feb. 1939.

The Healing of Joint Fractures. KEENE O. HALDEMAN, M. D. J. Bone and J. Surg., Oct. 1938.

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Paraffin Wax Bath. AGNES K. MOFFAT. Canad. J. Occup. Ther. and Physio., Apr. 1939.

The Paraffin Bath in Peripheral Vascular Disease. SAMUEL H. SEDWITZ, M. D. Arch. P. T., Mar. 1939.

The Elliott Treatment of Pelvic Inflammatory Diseases of Ambulatory Women. EARL CONWAY SMITH, M. D. New Orleans Med. and Surg. J., Jan. 1939.

Elliott Therapy of Pelvic Inflammations in the Negress. GEORGE A. WILLIAMS, M. D. Southern Med. J., Nov. 1938.

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Physiologic Considerations of Artificial Fever Therapy. MILTON G. SCHMITT, M. D. Arch. P. T., Apr. 1939.

Fever Therapy in Resistant Gonorrhea. Abst. in J. A. M. A., Feb. 4, 1939, from J. Urol., Dec. 1938.

Hypophysial Diabetes: Action of Fever. Abst. in J. A. M. A., Feb. 4, 1939, from Presse Medicale, Paris, Dec. 10, 1938.

Splenic Volume and the Polycythemia of Artificial Fever in Intact, Unanesthetized Dogs. LAURENCE L. PALITZ. Amer. J. Physiol., Mar. 1, 1939.

The Effect of Induced Hyperpyrexia on the Urea Clearance of Rheumatic Patients. LEE E. FARR, M. D., and JOHANNES K. MOEN, M. D. Amer. J. Med. Sci., Jan. 1939.

Artificial Fever Therapy. LEON BROMBERG, M. D. J. Missouri M. A., Jan. 1939.

The Present Status of Fever Therapy. LYNN T. HALL, M. D. J. Iowa State Med. Soc., Dec. 1938.

A Department of Artificial Fever Therapy at Notre-Dame Hospital, Montreal. ALBERIC MARIN, M. D. Canad. Hospital, Dec. 1938.

The Rationality, Practicability and Limitations of Induced Fever as a Therapeutic Agent. WILLIAM BENHAM SNOW. Med. Rec., Dec. 21, 1938.

Electrolyte Balances During Artificial Fever with Special Reference to Loss Through the Skin. E. HENRY KEUTMANN, SAMUEL H. BASSETT, and STAFFORD L. WARREN. J. Clin. Invest., Mar. 1939.

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The Treatment of Allergy. ROBERT CHOBOT, M. D. Public Health Nurs., Mar. 1939.

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Occupational Therapy Modernized. MARY E. MERRITT. Modern Hospital, Dec. 1938.

Short Wave Diathermy in Tone Deafness. Questions to the Editor. J. A. M. A., Feb. 11, 1939.

The Classification and Treatment of Obesity. J. K. FANCHER, M. D. J. Med. Assoc. of Georgia, Jan. 1939.

Water Bed for the Bedridden. CARL EWALD, M. D. Northwest Med., Dec. 1938.

Chilling of the Body Surfaces: Its Relationship to Aural and Sinus Infections. H. MARSHALL TAYLOR, M. D., and LUCIEN Y. DYRENFORTH, M. D. J. A. M. A., Nov. 5, 1938.

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Some Considerations of Wound Healing. W. D. GATCH, M. D. Southern Surg., Dec. 1938.

Thyroid Stimulation by Cold. G. C. RING. Amer. J. Physiol., Feb. 1, 1939.

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Late Results in Retinal-Detachment Operations. DOHRMANN K. PISCHEL, M. D. Amer. J. Ophthal., Feb. 1939.

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The Treatment of Acute Anterior Poliomyelitis. H. H. HYLAND, M. D.; W. J. GARDINER, M. D.; F. A. HEAL, M. D.; W. A. OILLE, M. D., and O. M. SOLANDT, M. D. J. Chart. Soc. M. and Med. Gym., Mar. 1939.

The Mental Hygiene Aspect of the Care of the Orthopedic Patient. EDWARD L. COMPERE, M.D. Occup. Ther. & Rehabil., Feb. 1939.

The Mental Hygiene Aspect of the Care of the Orthopedic Patient. EDWARD L. COMPERE, M.D. Occup. Ther. & Rehabil., Feb. 1939.

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Re-Establishment of the Circulation in Extremities. WILLIAM B. KOUNTZ, M. D. Arch. P. T., Mar. 1939.

The Paraffin Bath in Peripheral Vascular Disease. SAMUEL H. SEDWITZ, M. D. Arch. P. T., Mar. 1939.

Surgical Treatment of Varicose Veins and Ulcers by Segmental Sclerosis. GERALD H. PRATT, M. D. Amer. J. Surg., Apr. 1939.

Acetyl Beta Methylcholine Chloride by Iontophoresis in the Treatment of Arthritis and Certain Peripheral Vascular Disturbances of the Extremities. O. B. KIEL, M. D. Texas State J. Med., Dec. 1938.

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Undergraduate Education in Physical Therapy. CLARENCE W. DAIL, M. D., and FRED B. MOOR, M. D. Arch. P. T., Apr. 1939.

Psychological Factors in Physiotherapy. H. CRICHTON-MILLER, M. D. Brit. J. Phys. Med., Feb. 1939.

Physiotherapy and Orthopedics, Part III. W. SAYLE CREER, M. Ch. Brit. J. Phys. Med., Feb. 1939.

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Physiotherapy in Furunculosis. DR. JEAN MEYER. Brit. J. Phys. Med., Mar. 1939.

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Effect of Ultraviolet and Visible Rays Upon Animal Septicemia. A. J. NEDZEL, M. D., and LUDWIG PINCUSSEN, M. D. Arch. P. T., Jan. 1939.

Experiences with a New Type of Mercury Glow Lamp. RICHARD KOVACS, M. D. Arch. P. T., Nov. 1938.

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REHABILITATION

Before and After. WILLIAM O. RICE, M. D. Hospitals, Apr. 1939.

Security for the Child with a Speech Handicap. SARA STINCHFIELD. Crippled Child, Apr. 1939.

Role of Rehabilitation in American Sanatoria. HOLLAND HUDSON, Hospitals, Feb. 1939.

RELAXATION

We Need Restful Sleep. EDMUND JACOBSON, M.D. Public Health Nurs., Jan. 1939.

The Cripple and His Daysman. HARRY H. HOWETT. Crippled Child, Feb. 1939.

SPASTIC PARALYSIS

Speech Therapy as a Unit in the Project for the Treatment of Cerebral Palsy. ELEANOR JANE MILWARD. Occup. Ther. and Rehabil., Apr. 1939.

Understanding and Guiding the Spastic. EARL R. CARLSON, M. D. Amer. J. Nurs., Apr. 1939.

Nursing Care for the Spastic Child. MARGARET M. GOREY, R. N. Amer. J. Nurs., Apr. 1939.

Infantile Cerebral Palsy. JOHN F. POHL, M. D. Journal-Lancet, Mar. 1939.

TUBERCULOSIS

Tuberculosis Peritonitis. JOHN G. STUBENBORD, M. D., and JACK SPIES, M. D. Surg., Gynec. and Obst., Sept. 1938.

Treatment of Tuberculosis of the Bladder. LORENZO F. MILLIKEN, M. D. Penna. Med. J., Jan. 1939.

ABSTRACTS

John S. Coulter, M. D.

Medicinal Baths

Queries and Minor Notes. In the J.A.M.A., 111:20:1866, November 12, 1938.

To the Editor: I should like to have an opinion on therapy of medical baths as practiced in Europe. Foreign physicians have apparently brought with them into this country the idea of medicinal baths; for example, the carbonic acid bath, the oxygen bath, the oxygen bath with iodide. I do not mean the natural spring baths so much as I mean the packaged chemicals which are used in a patient's home. Please discuss the subject.

M. D., New York.

ANSWER:—The exact sphere of usefulness of artificial baths modeled after natural therapeutic baths has not been determined. It would seem in many instances that medicinal baths play only a minor role in the therapeutic regimen of the spa. At the spa, change of environment, regulation of activities, modification of diet, change of climate and institution of therapeutic measures may all be factors in the beneficial effects which are obtained. When one attempts to reproduce the beneficial effects of spa treatment simply by adding certain chemicals to the water in the patient's own bathtub, little benefit results.

There are some physicians, however, who feel that artificial Nauheim baths may be of some value in the management of certain milder forms of cardian decompensation. The so-called "sprudel" water of Bad Nauheim is a naturally warm, saline solution, highly impregnated with carbonic acid gas. The temperature varies from 86 to 93 F. One may add 32 ounces of sodium bicarbonate and 22 ounces of sodium acid sulfate to 40 gallons of warm water (86 to 93 F.) to produce an arti-

ficial Nauheim bath which will generate approximately 250 cc. of gas per liter of water. Any competent pharmacist can supply the physician with a formula for the chemicals to be used in preparing such a bath.

Though there is little information available on "oxygen" baths, there are certain natural waters in Europe which contain iodides and bromides. Iodides and bromides are present in minute quantities in many "muriated" waters. Such baths could be produced artificially but there is so little evidence that these substances in minute quantities are of value that there seems no reason to add them.

It is unquestionably true that American physicians have paid insufficient attention to their own natural spas and that they are not nearly as conscious of the value of spa therapy as are European physicians. Nevertheless, the attempt to produce artificial mineral waters for use in the patient's home seems a dubious procedure at the very best. Because the skin is incapable of any great amount of absorption, medicinal agents incorporated in baths produce little or no therapeutic effect.

Physical Characteristics of Short Wave Diathermy

Allan Hemingway, Ph.D., and K. W. Stenstrom, Ph.D., Minneapolis, Minnesota. In the J.A.M.A., 111:25:2298, December 17, 1938.

A Typical Oscillator Circuit

There are several typical circuits for the generation of short wave diathermy currents. These may be divided into two groups: those which produce the longer of the short wave diathermy currents, that is, frequencies in the range from 10 to 100 megacycles (from 30 to 3 meters), and a second group producing frequencies greater than 100 megacycles. As a typical oscillator of the first group, the simple two-tube "push-pull" circuit will be described. This type of oscillator for production of long wave diathermy currents (1 megacycle per second) has been described by Hemingway and Witts. The same typical current may be used for the generation of higher frequencies. This entire circuit can be considered to consist of three essential parts: (a) the power supply, (b) the oscillating circuit and (c) the output circuits.

Characteristics of Short Wave Diathermy Current

(a) *Position of Electrodes*—When long wave diathermy is used, it is necessary to place the electrodes in contact with the skin. In many treatments this is a satisfactory procedure but in some cases it is unsatisfactory, especially when a large electrode is to be used over some irregular surface in which there are bony projections. With short wave diathermy it is possible to place an insulating pad or to interpose a layer of air between electrode and cutaneous surface, or one may use a coil of fairly rigid insulating cable wrapped around a limb but at some distance from the cutaneous surface. By applying short wave electrodes at a distance, it is possible to heat the desired region without causing irritation of the skin.

(b) *Measurement of Temperature*—One of the reasons why so little progress has been made in determining the temperature distribution of animals or patients treated with short wave diathermy is that it is not possible to measure the temperature of a heated tissue by a thermocouple or a mercury thermometer during the passage of the current. These metallic temperature measuring devices when placed in a short wave electrical field behave as receiving antennas and foci for the short wave current. In measuring the temperature of a tissue heated by short wave diathermy the customary procedure is to shut off the diathermy current and insert the thermocouple needle into the heated tissue. In the time interval between the shutting off of the current and the final equilibrium deflection of the galvanometer a considerable fall in temperature may occur, especially in a vascular region.

(c) *Measurement of Dosage*—With short wave diathermy it is not possible to designate dosage in terms of diathermy current which would be applicable to all types of treatment. The reason for this is that as the frequency increases from the long wave range, 0.5-2.0 megacycles per second, to the short wave range, 10-100 megacycles per second, the wattless component of the current increases. The wattless component is increased still more when the electrodes are used at some distance from the skin and varies with shape, size and position of the electrodes. The dosage must be regulated by experience as judged by the sensation of heat in the patient. Once a dosage calibration on this patient's tolerance basis has been established one can assume that for a given position, size and shape of electrode and shape, size and position of the region of the body heated the wattless component remains the same and that the electrical conditions can be repeated.

(d) *Temperature and Heat Distribution.*—1. Experiments on Solutions and Dead Tissues: A stroking characteristic of short wave electrical fields is that, when the field intensity is kept uniform and electrolytic solutions of various concentrations in test tubes are placed in the field for the same length of time, the rate of heating for the different solutions varies.

Experiments on Living Animals and Man: As a result of the interesting studies on selective heating as a function of the wavelength of solutions and tissues in vitro, the results of temperature, distribution in living tissues becomes a problem of prime importance. The difference between dead excised tissues and living tissues in situ are that: 1. There is in the living body a powerful equalizing action exerted on the tissue temperature by the circulating blood. The importance of this was well demonstrated by Binger and Christie for long wave diathermy. These investigators showed that the circulation through a locally heated region tended to reduce any local rise in temperature. 2. A tissue in situ is in contact with and surrounded by other tissues. These neighboring tissues, which may be good conductors, such as muscle and plasma, tend to exert a "shielding" effect. The heating of a particular tissue such as bone in a living animal is quite a different problem from the heating of bone in a test tube surrounded by glass or air. The measurements of Mortimer have indicated the importance of the equalizing effect of blood flow on temperature of the visceral organs of dogs heated by short wave diathermy. Mortimer and Osborne, Coulter and Carter, and Coulter and Osborne have measured the increase in temperature at various sites in human subjects, using short wave diathermy current of wavelengths from 6 to 24 meters, and have reached the conclusion that there is no specific or selective heating shown that varies with the wavelength. It would seem from their work that one wavelength is as good as another.

Fractures of the Lower Leg and Ankle

Clay R. Murray, M.D., New York City. In Industrial Medicine, 7:12:711, December 1938.

Ankle fractures can be classified as follows:

The first group represents the easiest group to treat with the shortest disability time and with the most certainty of success.

The first type of fracture is a lineal fracture of the external malleolus. There is no reduction needed. The pathology is soft-part pathology, which has a great deal to do with future functioning. Splinting can be intermittent and allow of soft-part pathology; no immobilization is needed, except the posterior lower splint, and ankle exercise can be allowed six or eight times a day for five-minute periods, with the use also of hot soaks. The total period of soakage necessary is ten days. Then strapping of the ankle or the wearing of a skating ankle brace, the kind containing whalebone supports on the sides, for a period of two to three weeks thereafter. Full weight-bearing can be allowed with crutches in three weeks and without crutches in about four weeks; the total disability time should not run beyond six weeks.

The second type of case is the same type, in which, in this sort of story, one has actual separation with, however, the bony portion of the malleolus on the inside and remaining attached to the tibia with the malleolus displaced laterally. It does require reduction and carrying of the astragalus back by direct lateral pressure to its normal position beneath the tibia, and it does mean the splint cannot be removed for three weeks.

The disability time of the patient is no longer than that of the patient who has not had the separation, but his splints cannot be removed—for exercise and the hot soaks and the physical therapy aids, in the early phase—not until the end of three weeks, instead of intermittently, at the end of 48 hours, as in the previous case. Whatever significance this fracture has, then, in terms of disability is in terms of swelling of the leg when the patient gets up and around, and, as I hope to show you, that is a thing easily controlled if it is realized that it is a disability which may persist for some time.

Roller Skate Ambulatory Treatment of Fracture of the Patella

By Nina C. Wilkerson, M.D. In the J. Michigan State Med. Soc., 37:12:1086, December 1938.

The following treatment was given to a comminuted fracture of the left patella due to an automobile collision in which the driver of one car fractured the kneecap against the crank handle of the side window.

On the sixth day after injury, low-heeled oxfords were worn. The set-screw of an ordinary roller skate was removed to disengage

the front pair of wheels from the rear pair. The back part of the skate was strapped on the shoe worn on the affected side. The shaft of the skate was held firmly to the foot by means of strap webbing applied in a figure of eight around the ankle and foot. Weight bearing and flexion of the knee were avoided and relaxation of the quadiceps femoris was obtained when the patient became ambulant on cruches and the roller skate. Every four or five days the splint was removed for massage and then reapplied. In walking, with each forward surge on the crutches, the splinted leg was trundled ahead on the skate.

Conclusions

1. The conservative closed treatment in uncomplicated cases of fracture of the patella gives good results with less danger to the patient and with less expense.
2. Ambulatory treatment on a roller skate is advocated as a method of securing bony union with less immediate and remote disability. In addition the patient may attend to all or part of his duties.
3. A report of a case treated by the ambulatory skate method is cited wherein the patient was only partially incapacitated for duty and returned to full duty in eight weeks.
4. Physiological use is the best after-treatment of these cases.

Hydrotherapy and Its Use at the Betty Bacharach Home

By David B. Allman, M.D., F.A.C.S. In the J. Med. Soc. New Jersey, XXXV:12:735, December 1938.

One apparatus for such treatment is the Currence-Hubbard tank. The advantages of this tank are that the physical therapist can with ease manipulate the various portions of the patient's body without actually getting into the water; and that the temperature of the water in the tank can be changed rapidly, which is a distinct advantage in the treatment of certain conditions.

The therapeutic pool, when properly installed and equipped, is of course the acme of perfection in hydrotherapy measures; and when treatments are rendered by a competent physical therapist under the guidance of a physician, the number of pathological conditions which can be benefited by such treatment is legion.

The use of salt water increases the buoyancy of the body from seven to ten per cent; and, therefore, admitting that one of the advantages in hydrotherapy is the fact that the water gives buoyancy to the body, other things being equal, its use is of great advantage.

Our pool and pool room are entirely of tile with skidproof tile bottom, and although it is distinctly not a "swimming pool," its size is ample for such purposes, being twenty-four feet long and twenty feet wide. It ranges in depth from eighteen inches to four feet and has a capacity of 15,000 gallons of sterilized sea water whose temperature at all times is maintained by thermostats, so that we are able to change the entire contents of our pool every three hours.

The construction of this pool is such as to allow all manner of treatments to be applied with the maximum of ease and comfort for both patient and operator. The pool is raised from the floor so that the water level is a minimum of thirty-six inches above the surrounding floor levels; and being placed as it is in the middle of the room, all sides of the pool are accessible. It has a continuous slope on the bottom, and a graduated submerged ramp on one side of the pool. This will accommodate the various types and ages of patients and enable the technicians to perform their work with a maximum amount of comfort and efficiency. The pool has a specially designed gutter with drains around the perimeter to allow for placing of special apparatus necessary for certain types of treatment. The floors and walls of the pool room itself, of course, are tiled, as are the walls of the entire physical therapy department. All base caps and corners are of the sanitary radius type.

The water in the pool is heated, filtered, sterilized, and recirculated at the proper rate to give a minimum of three-hour turnover. The pool heater is of sufficient size to keep the water at ninety to ninety-five degrees and is thermostatically controlled.

Various types of mechanical appliances are placed at advantageous places around the building to supplement the exercises in the pool. These include mechanical bicycles, ladders, steps, incline planes, punching bags, rowing machines and other equipment designed to bring into play any particular afflicted muscle group.

This institution is unique in the fact that it takes any child under fifteen years of age, irrespective of race, color, creed, or financial status. Only a small portion of these afflicted children in the Home are suffering from infantile paralysis. The list of conditions for which they are receiving treatment includes:

Potts' disease, malnutrition, arthritis, third degree burns, muscular dystrophy, infections, fracture of the femur, ununited fractures, Perthes' disease, paraplegia, spastic diplegia, amyotonia congenita, Still's disease, and osteogenesis imperfecto.

A New Method of Joint Measurement and a Review of the Literature

Frank J. Wiechec, B.S., and Frank H. Krusen, M.D. In the Amer. J. Surgery, XLIII:3: 659, March 1939.

A New System of Joint Measurement

The system of measurement now in use at the Mayo Clinic is based on the half circle arc. Movements are measured either from 0 to 180 degrees or from 180 to 0 degrees. Wherever the part stops in its course on the scale, the number opposite the part indicates the degree of motion. The number of degrees, as will be seen in the records of this system, indicates the limit of motion on the half circle scale and not the amount of motion. Flexion and extension may be stated as flexion or extension to the number of degrees indicated on the scale.

The zero end of this arc is toward the head and median line of the body. As movement approaches the head, the angle of the joint becomes smaller and reading on the scale will be less. Motion away from the head will increase the angle, and the reading on the scale will be higher. The same is true when measuring toward and away from the body; the angle of motion will decrease as it approaches the median line and increase as it moves away from the median line. In rotation, including pronation and supination, the zero end is toward the median line of the body. Extension is movement toward 180 degrees, flexion toward 0 degrees, and the half circle arc in the anteroposterior plane. Hyperextension is movement toward the head, and measurement will read from 180 to 0 degrees. Measurement of adduction will read toward 0 degrees and of abduction toward 180 degrees. These measurements are made with the arm in the prone position in the lateral plane. Internal rotation is toward 0 degrees and external rotation toward 180 degrees on the anterior half circle arc in the transverse plane.

Neutral Position—The neutral position is that position of the joint from which measurements shall proceed. From this position the joint will begin on its course of movement. Readings on the scale may begin either from 0, 90, or 180 degrees. The normal limits of motion for each joint as here given can be considered only as approximate.

An instrument has been devised at the clinic by which any joint in the body can be measured.

The Influence of Posture on Skin and Subcutaneous Temperatures

H. S. Mayerson and L. A. Toth. In Amer. J. Physiology, 125:3:474, March 1, 1939.

The most fundamental alteration which occurs in changing from the recumbent to the standing posture is the sudden shifting of a column of blood, the length of the body from a horizontal to a vertical position where it exerts a hydrostatic pressure. Blood tends to accumulate in the parts of the body below the level of the heart, the stroke and minute volumes of the heart decrease and various compensatory mechanisms are brought into play in an effort to maintain an equitable distribution of the circulating blood.

Summary

Assumption of the upright position is usually accompanied by a prompt and significant fall in the skin and subcutaneous temperatures of the body. At room temperatures of 25 to 27 degrees C. the changes are most marked in the lower extremities and progressively less in the hands, abdomen, chest, neck and forehead. At high environmental temperatures the changes are uniform and of the same magnitude in the extremities and trunk. Heating of an extremity in the upright position overcomes the postural effect until complete vasodilatation is achieved at which point the postural change is again evident. No significant differences were found in the temperature response of subjects who showed signs of syncope in the upright position and those who did not.

Clinical Aspects of Peripheral Vascular Disease

By Howard C. Eddy, M.D. In the Ohio State Med J., 35:1:21, January 1939.

It is essential that patients be taught to keep their feet clean, warm, and dry. The physician must remember that the use of cradles or other baking devices increases local

metabolism and frequently causes burns. He must teach his patient the avoidance of minor traumata and prompt attention to minor infections, and for his own part he must avoid meddlesome minor surgery. Buerger's disease of the great toe is often taken for ingrown toenail. The patient may take Sitz baths to produce vasodilatation, spending 10 minutes in comfortably hot water to the hips once or twice a day. Buerger's exercises are easily taken by the patient at home. These exercises consist in the elevation of the legs at an angle of 45 degrees for two minutes followed by a period of dependency until rubor is established followed by two minutes of rest with the legs in the horizontal position. These exercises are repeated four or five times twice a day.

The Pavex machine is an apparatus for the alternate suffusion and emptying of the limb by means of alternate negative and positive pressure. It is indicated particularly in the treatment of arteriosclerosis obliterans and emboli in peripheral vessels. The principal contraindication is the same as that for massage; that is, infection. It possesses the disadvantage that the machine is quite expensive and is not likely to be available away from large medical centers. A course of treatment in the arteriosclerotic case usually consists of about 40 treatments given over eight weeks at the rate of five hours' therapy a week.

•Fracture of the Elbow and Volkmann's Ischemic Contracture

Henry W. Meyerding, M.D. In Minnesota Medicine, 22:2:100, February 1939.

Conservative Treatment of Volkmann's Ischemic Contracture

Volkmann's ischemic contracture may occur in a few hours, and the earlier treatment is begun the better the results will be. As the damage to the soft tissues may be benefited by release of intrinsic pressure, a consideration of the methods previously described should be given. No time should be lost in attempting gradual extension of the involved muscles, and the stretching method of the late Sir Robert Jones generally is recognized as excellent.

I have found many splints in use but prefer the simple and inexpensive wooden tongue-depressors found in every physician's office. With these padded and held by strips of adhesive tape, the principles of Jones may be carried out until stretching of the wrist requires longer splints, which are usually made of a thin piece of boxwood. The use of rubber bands to pull the extended hand toward the longer splint is useful in extending the wrist. The banjo-splint, used with rubber bands fastened to adhesive on the fingers, permits the fingers to be exercised at all times and is most efficient; it is inexpensive, can be made in a few minutes, and permits the patient to be cared for at home.

Care must be taken to gain the confidence of these children, and after a short time they will become interested and will cooperate exceedingly well. Thus the first few treatments may consist of heat and whirlpool baths combined with light massage. The splints soon may be adjusted and worn during the intervals between treatments. Active motion is performed willingly, and as confidence is gained active motion may be supported by gentle passive motion and electrical stimulation. We at the clinic rely principally on heat and massage as aids to gradual stretching and do not believe that painful, passive motion or forceful manipulation under anesthesia is advisable.

The next stage in the treatment of Volkmann's ischemic contracture is that in which several months have elapsed since fracture, during which time treatment has been inadequate. The pain and swelling are gone and the hand is sensitive to cold and has the typical claw-like position; motion is limited. Usually the hand is held in pronation and there is limitation of motion in the elbow. Ulceration and scars from pressure of splints and bandages are not infrequent. Paralysis from primary injury, or secondary to scar formation, may involve one or more of the main nerve trunks. The radial pulse may be absent, and the arm and hand have lost the cyanotic appearance and are white. Attempts to straighten the fingers with the wrist extended brings out the tight flexor tendons and the hard atrophied flexor muscles; the finger nails cut into the hand of the examiner. The extensor group of muscles are, on the other hand, preserved or only slightly involved. There may be atrophy of bone, myositis ossificans, and roentgenograms may disclose malposition of the fracture, requiring correction. All forms of treatment now prove less satisfactory, and prolonged and adequate conservative treatment is best. First the Jones, or banjo-splint, method of extension, combined with physical therapy, should be tried. When this has

failed, the next stage is reached and surgery may now render the contracture more responsive to conservative treatment.

The Function of Muscles in Locomotion

By Herbert Elftman. In the Amer. J. Physiol., 125:2:357, February 1, 1939.

The analysis of the forces involved and of the energy transfers which take place in walking, presented in the previous paper, serves to concentrate attention on the dominant role which muscles play in locomotion. Not only do the muscles provide forces which modulate the other forces present so as to insure the desired trajectory of the body, but they also govern the fluctuations in energy, occasioned by the changes in kinetic and potential energy of the body. This involves the alternate acceptance and release of energy by the muscles of the leg, the process going through two complete cycles during each double step.

In order to obtain further information concerning the function of muscles and to investigate some of the factors which influence their efficiency, it is necessary to recase in terms of muscle units the data obtained in the form of resultant muscle torques on parts of the leg. This could be done and a unique solution obtained, if the muscles with which we are concerned in all cases passed over only one joint. Although the vasti and many of the muscles around the hip-joint satisfy this requirement, such important muscles as the hamstrings, rectus femoris and gastrocnemius traverse two joints. No unique solution is possible for such a system with the data at hand but the limiting conditions can be found by a consideration of a system composed entirely of one-joint muscles and of one consisting of a single muscle passing over the three joints.

Summary

1. Muscles function in locomotion by (a) exerting torques which cooperate with the other forces present in determining the movements of the body; (b) regulating energy exchange, by transmitting, absorbing, releasing and dissipating energy.

2. The exertion of torque, without movement, and the transmission of energy by "tendon action" involve the doing of no physical work by the muscle tissue. They do involve the production of tension and its maintenance.

3. The total energy received by the muscles of the leg is equal to the total amount of work which they do in the course of a double step, provided that the initial condition of the body is duplicated at the end of the step.

4. A single muscle passing over the hip-, knee- and ankle-joints would be able to perform efficiently all the functions of the leg muscles in walking. Such a muscle, however, would present structural difficulties and would not be adaptable to individuated movements. The actual system of one-joint and two-joint muscles represents a compromise between the efficiency of the three-joint muscle and the adaptability of those passing over only one joint.

5. The ability to dissipate energy, regrettable as it may seem during the maintenance of regular movement, is as necessary a function of muscle as any other, since it makes deceleration possible.

Poliomyelitis Treated by Tilting Stretcher

James A. Kerr, B.Sc., M.D. Glasg., D.P.H. In Lancet, CCXXXVL:6019:24, Jan. 7, 1939.

On August 10 the legs were put up in plaster. On the 19th all the intercostal muscles on both sides became paralyzed and there was weakness of the left leaf of the diaphragm, which rapidly led to dyspnea and cyanosis. In anticipation of such an emergency a stretcher had been fitted on a tilter apparatus supplied by the Tor Equipment Co. Ltd., Croydon. This was based on the principle of the rocking method of resuscitation described by Dr. F. C. Eve of Hull. The boy was at once placed on this stretcher and rocking was commenced and dyspnea and cyanosis were relieved within ten minutes.

As no motor apparatus was available the boy was swung continuously for five days at the rate of 12 rockings per minute, and during this period the intercostals and diaphragms gradually resumed function. The angle through which the stretcher was swung was about 35 degrees from the horizontal on either side. On the fifth day the tilting was discontinued for twenty minutes every two hours, and the time of stopping was increased each day until the eighth day he was being swung for twenty minutes every two hours. On the ninth day (August 27) he was permanently removed from the stretcher.

Symposium: Treatment of Fractures

Conservative Treatment of Fractures

E. L. Eliason, M.D., Philadelphia, Pennsylvania. In Surg., Gynec. and Obstetrics, February 15, 1939.

A fracture recovers best when the nutrition of the bone and those structures associated with it most nearly approach normal. Physical therapy aids in restoration of blood supply. It should begin, if feasible, when the treatment of the fracture begins, not after union has occurred.

Return to full function of weight bearing, etc. must be withheld until solid clinical union is found to be present. The roentgenographic evidence with regard to the rigidity of callus cannot be depended upon.

It has been our experience that the patient himself is his best physical therapist. It should be explained to him that return to function is his job and that only by exercise, supplemented by massage and heat, can he get well. He should be carefully instructed in how to use all of these measures. Aided active motion should be explained to him. Pain is nature's warning of trouble. He will not injure himself but a physical therapist might. if a therapist is on the case at once, the patient transfers all responsibility to his shoulders, feeling that he, only a patient, does not know enough to conduct his own treatments. The individual is his best physical therapist even without the various baths, electrical rays, lights, currents, and other such measures.

Four Physiotherapeutic Devices for the Treatment of Peripheral Vascular Disorders

By Hugh Montgomery, M.D., and Isaac Starr, M.D. In Amer. J. Medical Sciences, 197:4: 485, April 1939.

The purpose of this presentation is to describe four physical therapy devices for the treatment of peripheral vascular disease. They have been used successfully at this hospital for periods of from 1 to 4 years.

A simple Thermoregulator for Maintaining Optimum Temperature in a Foot Cradle. Starr and Severinghaus have described thermoregulated cradles, and these devices have been used for a sufficient time to prove that they will relieve pain in many cases of peripheral vascular disease.

Simple Apparatus for the Application of Alternate Suction and Pressure to the Fingers. The simple apparatus to be described was designed to apply alternate suction and pressure to any finger. It can be used by the patient at home. The necessary materials cost less than $1.00.

One needs (1) a section of glass tubing to fit the fingers loosely. We use a piece 5 inches long, of 1 inch internal diameter, $\frac{1}{16}$ inch wall, with flamed ends; (2) surgical drainage tubing 1 or 1¼ inches across when lying flat; (3) one No. 6 rubber stopper with hole bored to fit (4) a glass or metal connecting-tube running to (5) a rubber bulb with single opening and without valves ("blind bulb," 1½ inches by 2⅝ inches). This bulb should be chosen with some care as it must be given negative pressure of 100 mm. Hg. All bulbs should be tested with a mercury manometer before buying or using them for this purpose.

An Apparatus for Giving Drugs by Iontophoresis. Treatment by iontophoresis had a vogue about 40 years ago but it was soon largely abandoned. Kovacs reopened the subject by introducing mecholyl iontophoresis for the treatment of arthritis. But the interest soon turned to its use in peripheral vascular disease. The necessary apparatus can be obtained from various manufacturers at a cost which has varied from $125 to $15. We have been using apparatus the parts of which can be bought at any radio supply store and assembled for about $15.00. Ten of these outfits are now in use and have been entirely satisfactory.

A Bed Altered to Permit a Dependent Position of the Legs. Before the development of the device to be described some patients always insisted on hanging their diseased legs out the side of the bed, claiming that any other position was more painful. In several of these cases the reaction of the skin to histamine gave evidence that the circulation was better when the limb was dependent. This was in accord with theoretical expectations as the hydrostatic element in the blood pressure of the peripheral arteries must be increased when the limb is dependent. Pearse and Morton have demonstrated this increased arterial pressure in the arteries of dependent legs of normal persons.

Obesity

W. F. Christie, M.D. In the Clinical J., LXVIII:3:106, March 1939.

Once fat is formed within the body, the only way of reducing it seems to be to make the body burn it. There are two methods of doing this: one is to increase metabolism by

means of drugs, which is dangerous; the other is to cut down the body's supply of fuel from outside sources, which, if wisely done, is safe.

Take first the question of drug treatment. Drugs cannot reduce surplus fat unless they are pushed to the extent of causing ill-health.

Muscular exercise is not a safe way of reducing those who are overweight. Stout subjects have little cardiac reserve; on slight exertion they became short of breath and develop a rapid pulse-rate. To run them up and down tennis courts or make them climb mountains is to court disaster.

Deep massage is another popular "cure." How can it dissipate the patient's fat? It is said that it does so by rupturing the cell membranes of fatty globules and allowing the oil to escape into the subcutaneous tissues but even if it does actually rupture cell membranes the oil will be reabsorbed from the injured site and deposited again elsewhere.

Sweating baths, such as Turkish and radiant heat baths, remove a pound or two of water from the body, but the water is replaced by the next few drinks. Cold increases metabolism, but the amount of fat which can be lost by taking a cold bath in the morning is negligible. Hippocrates' cure for corpulence was cold baths, exposure of the naked body to the open air, and certain dietetic restrictions. Of course, he knew perfectly well which of the three was the most important. From his day till ours, dieting has been, and still is, the most important single factor in the cure of obesity.

Dieting: By dieting, fat can be removed quickly or slowly. The weight loss is "rapid" when it exceeds 3 lb. a week, and "slow" when it is less than that amount. Rapid weight reduction is more dangerous than slow reduction, as it is apt to cause muscular and cardiac weakness. Patients who have reduced rapidly neither feel so fit, nor look so well, as those who have done it slowly.

Causation and Treatment of Brachial Neuritis

By J. Barnes Burt, M. D. In the Clinical Journal, LXVIII:4:141, April 1939.

All severe cases of subacromial bursitis set up pain down the back of the arm as far as the wrist and may give rise to a true neuritis, due to involvement of the circumflex nerve.

In treatment three stages must be considered. The first stage is characterized by pain, not only in the shoulder, but down the back of the forearm as far as the wrist. The second stage is characterized by dull pain in the shoulder, pain on movement, but no pain below the deltoid. In the third stage certain movements are restricted, but there is little or no pain when the shoulder is kept at rest. In this stage the supraspinatus and infraspinatus and the deltoid muscles are markedly wasted.

In the first stage complete rest is indicated and a sling must be worn. Use hot or cold applications to the shoulder, and ionization with sodium salicylate over the deltoid muscle.

In the second stage one school advocates the breaking down of adhesions under an anesthetic. The other school is against manipulation and advises various methods of physical treatment, such as infrared, hot mud and deep baths. When the cause is traumatic, manipulation under an anesthetic is indicated; whereas in the gouty or rheumatic type the various physical methods should be used, for nearly all the cases clear up eventually.

In the third stage many cases cure themselves by some sudden movement, such as is made in croquet or rowing, but where there is obvious difficulty to rotate, manipulation of the shoulder is indicated; in this stage manipulation seldom is followed by the severe pain so frequently met with after manipulating cases in the second stage.

For centuries physical treatment has proved to be of the greatest value in dealing with brachial neuritis, and spa treatment offers the safest and easiest method of providing this. In the first place movements of limbs which are almost impossible to carry out at home can be performed in deep-water baths, particularly when heat-packs or hot mud are applied to the area of primary trouble before the patient gets into the bath.

Secondly, the undercurrent douche is a safe and painless form of massage. It encourages the lymphatic and venous circulation at a time when massage is too painful and in the massage douche baths, massage under water is generally not nearly so painful as dry massage. Again there is the specific action of radioactive waters on gout and a general eliminating effect of drinking natural waters, together with the promotion of skin activity by the action of baths.

Massage for the treatment of neuritis has a bad reputation among both doctors and patients, although judiciously applied it is the most valuable treatment for a number of cases. The bad reputation is to some extent

the fault of doctors, who in the past have casually ordered massage without stating the area to be treated. If this question is left to the patient or masseuse it is quite easy to understand that the site of greatest pain generally is chosen for the operation. Massage is indicated in practically all cases in which fibrositis of the muscle is the cause. It is contraindicated where arthritis or bursitis is the cause, except very late in disease when most of the pain has disappeared and the muscles are wasted. The physicians must be careful to indicate the area to be treated and must choose the right time. If, as the result of tests carried out by himself, he considers the muscle too tender, three or four applications of constant current and radiant heat should be tried and the muscle tested again by the physician. It is wise to warn the patient that the first three applications of massage may be painful, but as long as the pain is not increased four hours after the massage it is safe to continue the treatment.

A Muscle Tester for Poliomyelitis Cases

By Adolph A. Schmier, M.D., New York, N. Y. In the J. Bone and Joint Surg., XXI:2:475, April 1939.

Because of the desire to test muscle strength more accurately and also to obtain a permanent record thereof, the author designed an ink-pointer attachment to an ordinary scale. Testing the strength of muscles with a spring scale is not a new procedure. Lovett and Martin published this procedure in 1916. However, with their method, in addition to the examiner, assistants were necessary to hold the extremity and to observe the reading on the scale at the moment the muscle gave. In order to make it possible for the examiner to carry out this procedure alone, the author attached an inker to the scale, which records the maximum muscle power on a printed chart. In addition, accessory appliances were made to fix the untested portion of the extremity, which ordinarily would have to be held by an assistant. A set of three scales is employed in order to test muscles by various strengths. The six-pound scale is graduated in ounces; the fifty-pound scale, in half pounds; and the 100-pound scale, in pounds. It is important to note that in the presence of fixed contractures, purely muscular movements cannot be elicited accurately, and the readings must, therefore, be accepted with care.

Book Reviews

OUTLINE OF PSYCHIATRIC CASE-STUDY: A PRACTICAL HANDBOOK. By Paul William Preu, M. D., Assistant Professor of Psychiatry and Mental Hygiene in the Yale University School of Medicine, New Haven. With foreword by Eugen Kahn, M. D. Cloth. Price, $1.85. *Pp.* 140. *New York: Paul B. Hoeber, Inc.,* 1939.

The adequate study of a patient suffering from a nervous or mental disease implies a history-taking and examination which is far more detailed than that usually obtained for any other type of illness. Consequently a plan whereby such material may be obtained in a most orderly and informative manner is highly desirable. This author has presented such a plan which, besides being extremely complete, is by far the most up-to-date approach that has appeared in print. The danger of so excellent a presentation, however, lies in its all-inclusiveness. Its chief value no doubt lies in its service as a source from which one interested in psychiatric problems may evolve his own practical form of examination.

THE MEDICAL CLINICS OF NORTH AMERICA. CHICAGO NUMBER, VOLUME 23, *NUMBER* 1, *JANUARY* 1939. (*Sold only by a year of six consecutive bimonthly numbers.*) *Cloth, per year,* $16.00. *Paper,* $12.00. *Philadelphia and London: W. B. Saunders Company,* 1939.

This number of the Medical Clinics contains a symposium on the medical management of gallbladder disease and fifteen clinics on other subjects. As there seems to be an increasing number of patients complaining of symptoms referable to the gallbladder and its associated organs, this clinic on the medical management of these conditions is especially timely for the general practitioner.

In the clinics on other subjects there is one of special interest to physical therapists; that is, short wave diathermy. This gives the technic for the application of medical diathermy by the electromagnetic induction method, and also a discussion on the therapeutic indications for short wave diathermy. Each of the other clinics contain much useful information for the general practitioner.

PYRÉTOTHÉRAPIE. Par Charles Richet, Professeur Agrégé à la Faculté de Médecine de Paris, Jean Surmont, médecin électro-radiologiste des hôpitaux de Paris, et Pierre Le Gô, électro-radiologiste des Asiles de la Seine. Paper. Price, 50 francs. Pp. 195, with 28 illustrations. Paris: Masson & Cie, 1938.

That fever therapy is gaining world wide attention is evidenced not only by current literature but by the appearance of this book. The author discusses fever therapy as produced by foreign proteins and micro-organisms in addition to physical measures, such as high frequency currents and external heating apparatus. This book should be read by all those interested in fever therapy especially as it covers a rather broad field. The author discusses quite fully the contributions made by all workers in this country as well as that done in France. An excellent discussion of the French methods using high frequency currents is given with illustrations of the different technics and machines used. The volume contains 195 pages, a large but poorly indexed bibliography and 28 illustrations. It is recommended, however, not only to physicians but also to physical therapy technicians.

THE PROBLEM CHILD IN SCHOOL. By Mary B. Sayles and Howard W. Nudd. Cloth. Price, $1.00. Pp. 288. New York: Commonwealth Fund, 1937.

Next to the home the school exerts the strongest influence upon the development of the personality of the child. It is in the school where the child begins to develop responsibilities and learns to "stand on his own feet." The teacher, although exerting authority second only to that of parents, directs her attention in a much more objective manner and with less emotional coloring. The teacher endeavors to develop a wholesome social attitude in the child thus making him aware of the significance of other people in the world to whom he must adjust. A wholesome program of play enables the child to employ direction and control upon his egotistic desires. The problem child in the schools is usually a problem child at home, and many difficulties which the child shows either in his school work or in his school behavior are reflections of emotional conflict arising from unwholesome home situations. The child's behavior in the school, therefore, deserves careful attention in the evaluation of the problem child.

THE PROBLEM CHILD AT HOME: A STUDY IN PARENT-CHILD RELATIONSHIP. By Mary B. Sayles. Cloth. Price, $1.50. Pp. 350. New York: Commonwealth Fund, 1937.

The importance of the years of childhood in the development of the adult personality is well recognized by psychologists. The training of the child naturally takes place primarily within the family and the home. The author has written a very thorough and instructive treatise upon this phase of personality development and has made available a splendid guide for those who are interested in the problems of the child. Stressing the needs of the child for protection and security, for wholesome guidance, and for companionship, the parent-child relationships are presented in simple straightforward words. As is well known so much of the problem child's difficulties are in reality the expression of maladjustments in the parents. Over-solicitousness of the mother very frequently is an expression of her own thwartings and disappointments in her relationship either to her husband or within her own family constellation. The "spoiled child" is the product of improper parental guidance.

This book is heartily recommended to those who deal with behavior problems of the child.

CHILDREN WITH DELAYED OR DEFECTIVE SPEECH: MOTOR-KINESTHETIC FACTORS IN THEIR TRAINING. By Sara M. Stinchfield, University of Southern California, and Edna Hill Young, Principal, Hill-Young School of Speech, Los Angeles, California. Cloth. Price, $3.00. Pp. 174, with illustrations. Stanford University, California: Stanford University Press; London: Oxford University Press, 1938.

Many physical therapists treating spastic paralysis cases are confronted with delayed or defective speech problems. This book considers the problem of the child who does not readily acquire speech or who perhaps fails entirely to develop speech responses at the age when most children have become fairly fluent in self-expression through speech. The authors do not believe that children with mentality sufficient to register sensory impressions and to formulate ideas will in time be able to express themselves normally without guidance. They also believe it is unjust to think that the child who cannot talk is either totally deaf or mentally deficient, because they

have found that many children, although retarded by speech deprivation, often made rapid progress once their liberation by speech was brought about.

It is shown that Nature's special time for the gaining of speech and the easy adjustment of muscles to the forms of speech are at the age of twelve to thirty-six months. In general after the third year speech movements become more and more difficult to gain or to change. The authors emphasize that the child who is becoming delayed in speech must be helped as soon as the delay occurs. They state that by using the procedure which is indicated in this book, the child whose speech is being delayed or stopped may be trained into it through help of a more definite, effective kind than has been used heretofore.

ADVENTURES IN RESPIRATION: MODES OF ASPHYXIATION AND METHODS OF RESUSCITATION. By Yandell Henderson. Cloth. Price, $3.00. *Pp.* 316. *Baltimore: The William and Wilkins Company,* 1938.

The author is a well known physiologist and is Professor of Physiology at Yale University Medical School. About seventeen years ago Haggard and Henderson devised a method of resuscitation from carbon monoxide poisoning and other forms of asphyxia. It consists in the inhalation of carbon dioxide diluted with air or oxygen. Their H. H. inhalator for this method has come into wide use.

This book gives the facts of respiration upon which this method of resuscitation from asphyxia is based. These facts are presented as a story of the adventures of the author when he was gathering this data. For instance, the account of the author's Pike Peak Expedition gives a most interesting account of the laboratory work on mountain sickness. There are other chapters on shock and acapnia, the fallacy of asphyxial acidosis, the control of breathing and blood alkali; carbon monoxide asphyxia; gases of peace and war; how breathing begins at birth; asphyxia of the newborn; resuscitation of the newborn; postoperative depression; the functional factor in pneumonia; failure of the circulation; the venous return and its failure; asphyxia by failure of the circulation, and muscle tonus as a factor in artificial respiration. This book will be of great value to anyone interested in the modes of asphyxiation and the methods of resuscitation.

ILLUSTRATED PRIMER ON FRACTURES. Prepared by the Special Exhibit Committee on Fractures in Cooperation with the Committee on Scientific Exhibit of the American Medical Association. Fourth edition. Cloth. Price, $1.00. *Pp.* 95, *with* 43 *illustrations. Chicago: American Medical Association,* 1938.

In this fourth edition there is a complete revision of the text and illustrations with an interleaving of blank pages for notes. It contains the accepted advances in the treatment of fractures as demonstrated by the exhibits held under the auspices of the Committee on Fractures at the annual meeting of the American Medical Association.

The importance of physical therapy in the treatment of fractures is emphasized. Active movements are encouraged as soon as possible after the reduction of a fracture, and the patient is taught to "set" his muscles. It is stated that the most valuable treatment after a fracture has been reduced and properly healed is active motion performed by the patient himself. Light stroking massage of the soft parts about a fracture is advised during the early stages of treatment to reestablish the vascular channels and thus dissipate the local edema. This book is highly recommended to physicians as it contains much essential information on fracture treatment.

THE LANGUAGE OF THE DREAM. By Emil A. Guthei', M. D. Cloth. Price, $3.50. *Pp.* 286, *with* 40 *illustrations. New York: The Macmillan Company,* 1939.

Dreaming is a normal mechanism, and everyone at some time or another dreams. Psychologists and psychiatrists in particular have been interested in the significance of dreams and at the present time there are some rather well accepted formulations regarding their meaning. The author of this volume has had considerable experience with dream material and has written an exceedingly lucid and instructive dissertation. He has discussed the origin of dreams, dream symbolization and the significance of dreams in the neuroses and psychoses, in a manner which besides being as scientific as our modern knowledge permits is also fascinating reading for the layman. It is probably the best book available on this subject at the present time.

HOFFA-GOCHT TECHNIK DER MASSAGE. By Doz. Dr. Hans Storck, Oberarzt der Orthopädischen Universitätsklinik, Berlin. 9th Edition, revised. Paper. Pp. 123, *with* 88 *illustrations. Stuttgart, Germany: Ferdinand Enke,* 1937.

This is a monograph on the technic of Hoffa-Gocht massage. The first part considers the physiologic effects of massage on muscle, skin, nerves, and tissue; the technic of effleurage, petrissage, friction, tapotment and vibration; indications and contraindications. The second part discusses the massage of various parts of the body, general massage, massage in neuralgia and muscular rheumatism. Part three considers massage and exercise. The illustrations are excellent. It can be recommended to those reading German as an authoritative book on the technic of massage.

PHYSIKALISCHE THERAPIE. By Professor Dr. H. Lampert, Director of the University Institute for Physical Therapy, Frankfort. Price, 6.19 *RM. bound. Pp.* 217, *with* 131 *illustrations. Dresden and Leipzig: Theodor Steinkopff,* 1938.

Under the title "Medizinsche Praxis" a series of specialized works have been published from time to time. The book on "Physikalische Therapie" is the 25th volume of this series. It is impossible to deal completely with every phase of physical therapy in a single volume, and this excellent work is no exception. The book is divided into three main divisions; namely, scientific foundations, technic and directions for treatment of disease. It is profusely illustrated.

The first section deals with heat and cold as a therapeutic measure, the rationale of moist packs, medicated baths, massage and exercise. It also includes therapy by means of ionized air and the breathing of medicated solutions. Ultraviolet light and radium therapy is also discussed. The chapter on electrotherapy, which includes galvanism, alternating currents, long and short wave diathermy, is written by Dr. Strauch of Frankfort. The second section on technic should prove to be very useful especially the technic of hot and cold baths of various types. Section three gives indications for treatment.

This volume is well written and an attempt has been made to apply scientific facts to the measures employed. The numerous diseases advocated for treatment by physical therapy would seem to many American physicians to be somewhat optimistic. However, this volume will well repay anyone who reads it because it presents some viewpoints that are not so common to this country. The book is recommended to both physicians and physical therapy technicians.

SURGICAL TREATMENT OF HAND AND FOREARM INFECTIONS. By A. C. J. Brickel, A.B., M.D., Departments of Anatomy and Surgery, Western Reserve University. Cloth. Price, $7.50. *Pp.* 300, *with* 166 *illustrations and* 35 *plates. St. Louis: The C. V. Mosby Company,* 1939.

It frequently has been emphasized by Kanavel that the primary requisites in the treatment of hand infections are an adequate knowledge of the anatomy of the hand, of the underlying pathological process present and of the proper methods of surgical treatment. This volume presents these primary requisites in an admirable manner. Chapter one gives some beautiful anatomical plates of the hand and forearm.

In chapter two there are presented studies of radiopaque injections of the hand spaces. The author demonstrates that the extent and form of these structures are revealed only when they are distended by the injected material and hence cannot be determined by dissection alone. Chapter three discusses the general principles of hand and forearm infections. In this chapter two pages only are devoted to physical therapy. This seems to be insufficient. Good surgical treatment may fall short of a good ultimate result if not followed by good physical therapy. It is believed that more space should be given to the detailed prescription of proper splinting, exercise and occupational therapy. Some statements in the discussion of physical therapy might be questioned—it is doubtful if "diathermy promotes the absorption of scar tissue."

There are also chapters on the regional surgery of the hand and forearm; human bites; the influence of diabetes and peripheral vascular disease upon infection; and the medicolegal aspects of hand injuries. This book can be highly recommended to the medical profession as giving the recent advances in the interpretation of the structure of the hand and forearm with the particular patterns exhibited by surgical infections in these parts and with the rationale of the surgical means employed to cure these infections or to minimize their results.

THE RELATION BETWEEN INJURY AND DISEASE. By Jewett V. Reed, B. S., M. D., F. A. C. S., Assistant Professor of Surgery, Indiana University, Indianapolis, and Charles P. Emerson, A B., M. D., D. Sc., Research Professor of Medicine, Indiana University. Collaborating: E. B. Mumford, B. S., M. D., F. A. C. S., Consultant U. S. Veterans Bureau Hospital. Cloth. Price, $7.50. Pp. 577, with 21 illustrations. Indianapolis: The Bobbs-Merrill Company, 1938.

The effects of an injury may remain entirely related to the injured tissues; or the injury may not only cause its illness but also be the starting point of a new disease; or the illness due to the injury and a pre-existing disease may each run its own course, neither one affecting the other; or the injury may aggrevate the pre-existing disease. Physicians treating injured persons in whose condition there is an element of liability are constantly asked to express an opinion of the above relation between injury and disease. Most standard textbooks of medicine and surgery do not consider this subject. The authors of this book state: "On the basis of the so-called 'expert medical testimony' a new and strange pseudo-pathology has been slowly evolving in the Courts, especially in connection with diseases of industrial workers alleged to be direct results of injuries received; and it will tend progressively to become more and more unscientific unless physicians on the witness stand make more determined efforts to substitute proper hoc reasoning for the post hoc arguments which in too many cases determine decisions."

This book can be recommended to officials of casualty insurance companies; to lawyers who present accident cases before Courts and Boards, and to physicians and surgeons.

TREATMENT IN GENERAL PRACTICE: THE MANAGEMENT OF SOME MAJOR MEDICAL DISORDERS. VOLUME II. Articles Republished from the British Medical Journal. Second edition. Cloth. Price, 10s. 6d. Pp. 436, with illustrations. London: H. K. Lewis & Co., Ltd., 1938.

The articles comprising this book appeared in the British Medical Journal between September 1935 and September 1936. Volume one considered the management of diseases of the respiratory system, acute infectious fevers and cardiovascular affections. The articles in this volume are grouped under diseases of the nervous system, diseases of the digestive system, diseases of the blood and blood-forming organs, rheumatic diseases, metabolic diseases, and diseases of the kidney. The authors of these articles are clinical teachers in various medical schools in England. There are chapters of interest to physical therapists on spondylitis, osteo-arthritis, lumbo-sacral and sacro-iliac strain by Buckley; rheumatoid and climacteric arthritis by Thompson; fibrositis by Copeman; physical methods of treating rheumatism by Ray; spa treatment in general practice by Holmes; and obesity by Douthwaite. This volume is a useful guide to the general practitioner.

THE ROENTGEN-RAY DIAGNOSIS OF DISEASES OF THE BONES AND JOINTS. By Paul C. Hodges, Professor of Roentgenology, the University of Chicago; D. B. Phemister, Professor of Surgery, the University of Chicago; and Alexander Brunschwig, Associate Professor of Surgery and Associate Professor of Roentgenology (Therapy), the University of Chicago. Cloth. Pp. 250, with 283 illustrations. Price, $4.75. New York and Edinburgh: Thomas Nelson and Sons, 1938.

This volume contains the material published in the sixth chapter of "Diagnostic Roentgenology" published by Nelson and Sons and also some new material. The publisher has issued this as a separate volume because of numerous requests from physicians and students of radiology, surgery and orthopedic surgery. The authors are authorities in the field of diseases of the bones and joints.

The first four sections on technical factors of film interpretation, the normal skeleton, alteration in bone density and the congenital anomalies of skeletal development are of special value to any medical student or physician. These sections contain two excellent charts for ready reference, one showing the average age of appearance of the centers of ossification and average time of bony fusion of epiphysis with diaphysis, and the other giving information on those phases of skeletal development likely to come up for consideration during the routine reporting of clinical roentgenograms.

There are many illustrations of the roentgenological appearance of bone diseases and these illustrations are especially clear. The various diseases of bones and joints are described fully, but fractures, dislocations and post-paralytic deformities are not included. This volume is highly recommended.

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